Installation, Start-Up and Service Instructions

CONTENTS

INTRODUCTION

The 39M series central station air handlers are usually installed with ductwork; they provide air conditioning at nominal capacities of 1500 to 30,500 cfm. The 39M air handler design allows hundreds of different configuration possibilities.

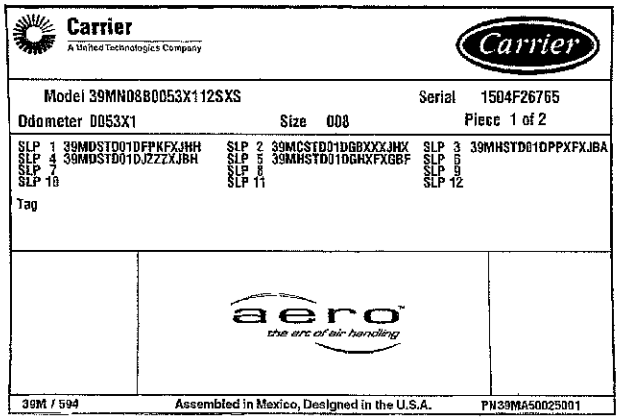


Fig. 1A — Unit Nameplate Label (Found on Each Component Section Shipped Separately)

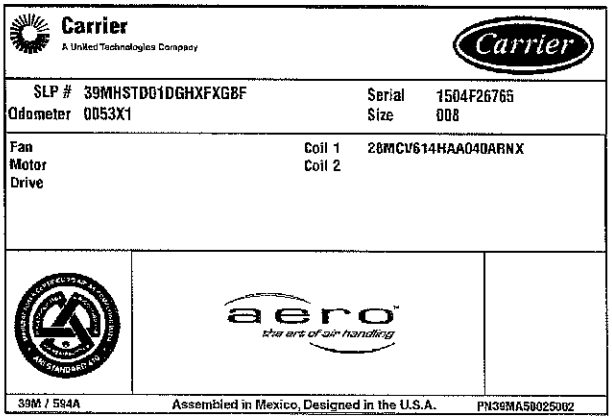


Fig. 1B — Section Nameplate Label (Each Component Section will have a Section Nameplate Label)

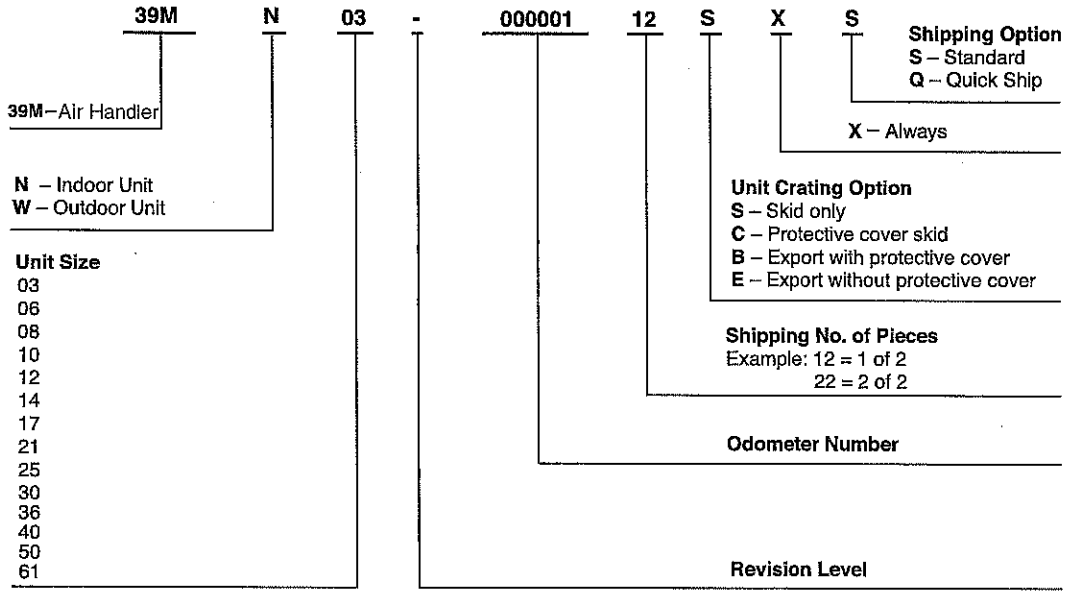


Fig. 2A — 39M Unit Nomenclature

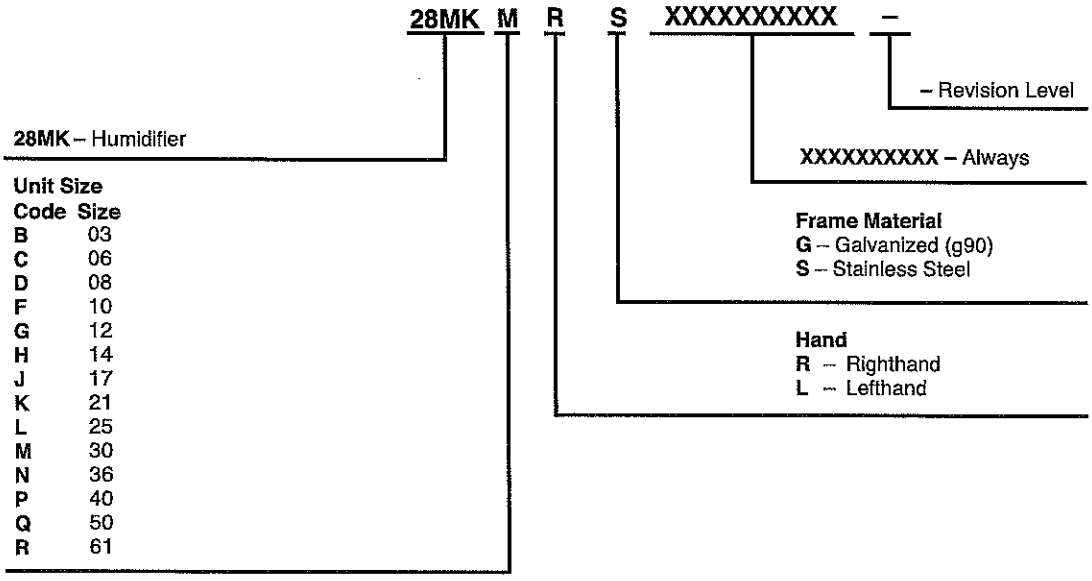
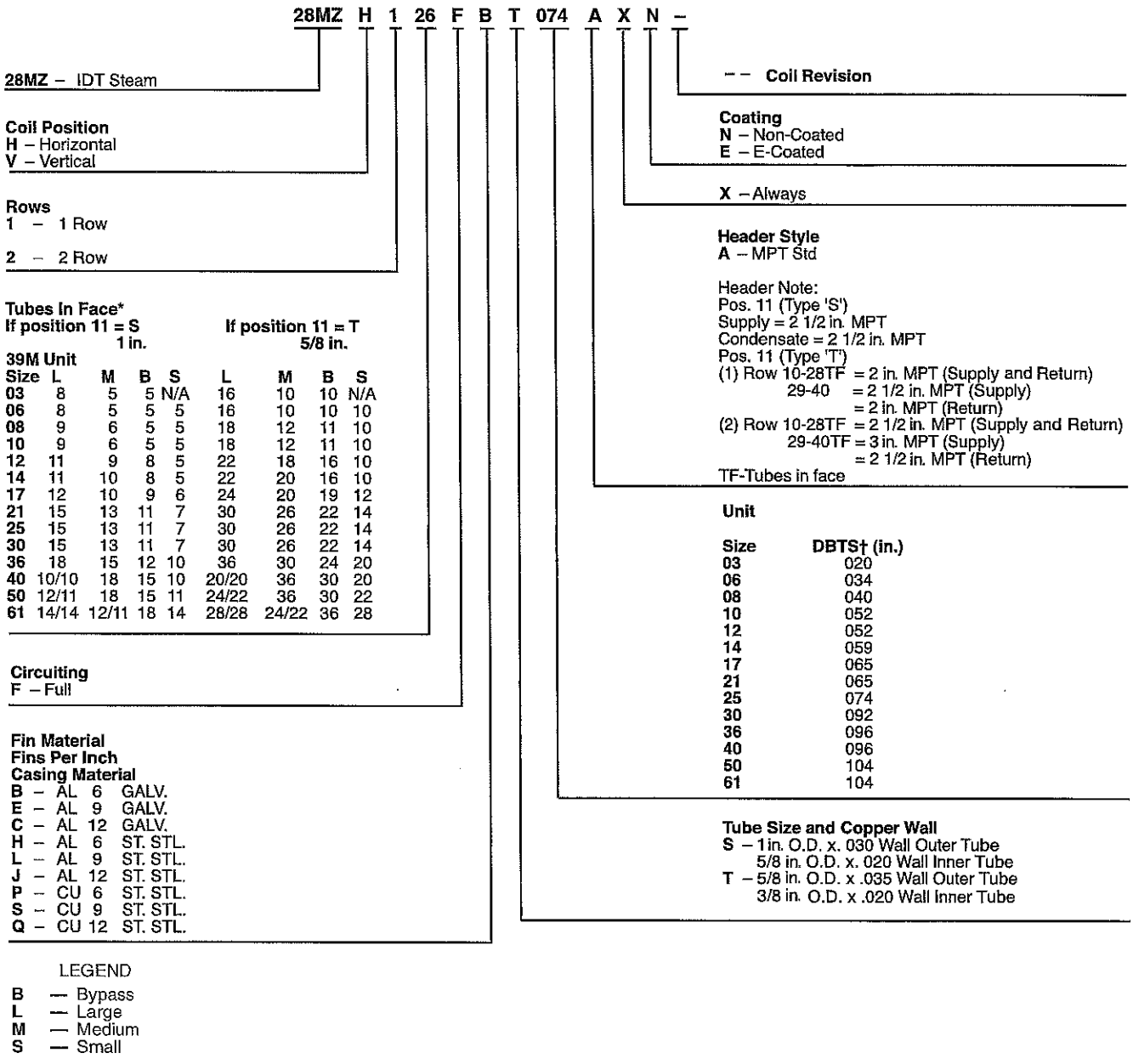


Fig. 2B — 28MK (Humidifier) Nomenclature



*Multiple values indicated that two coils must be ordered.
†Distance between tube sheets.

Fig. 2D — 28MZ (Steam Coil) Nomenclature

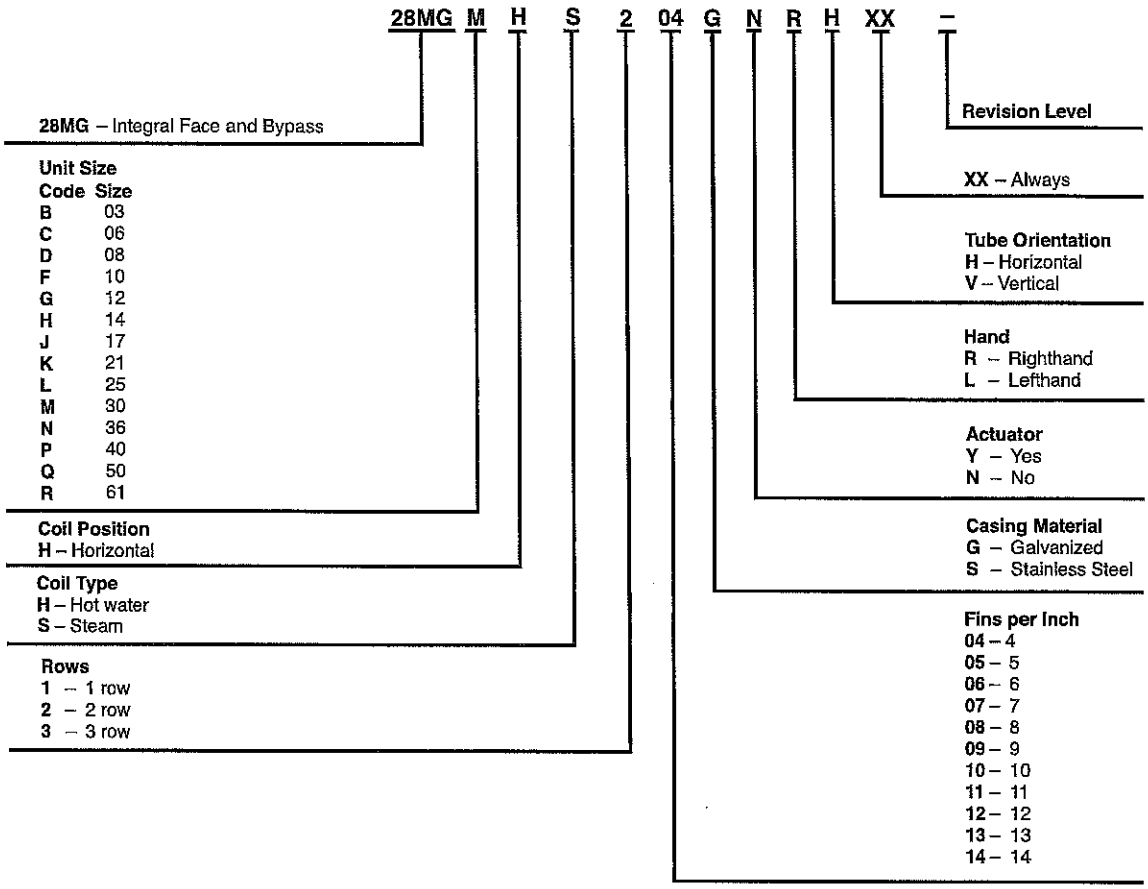
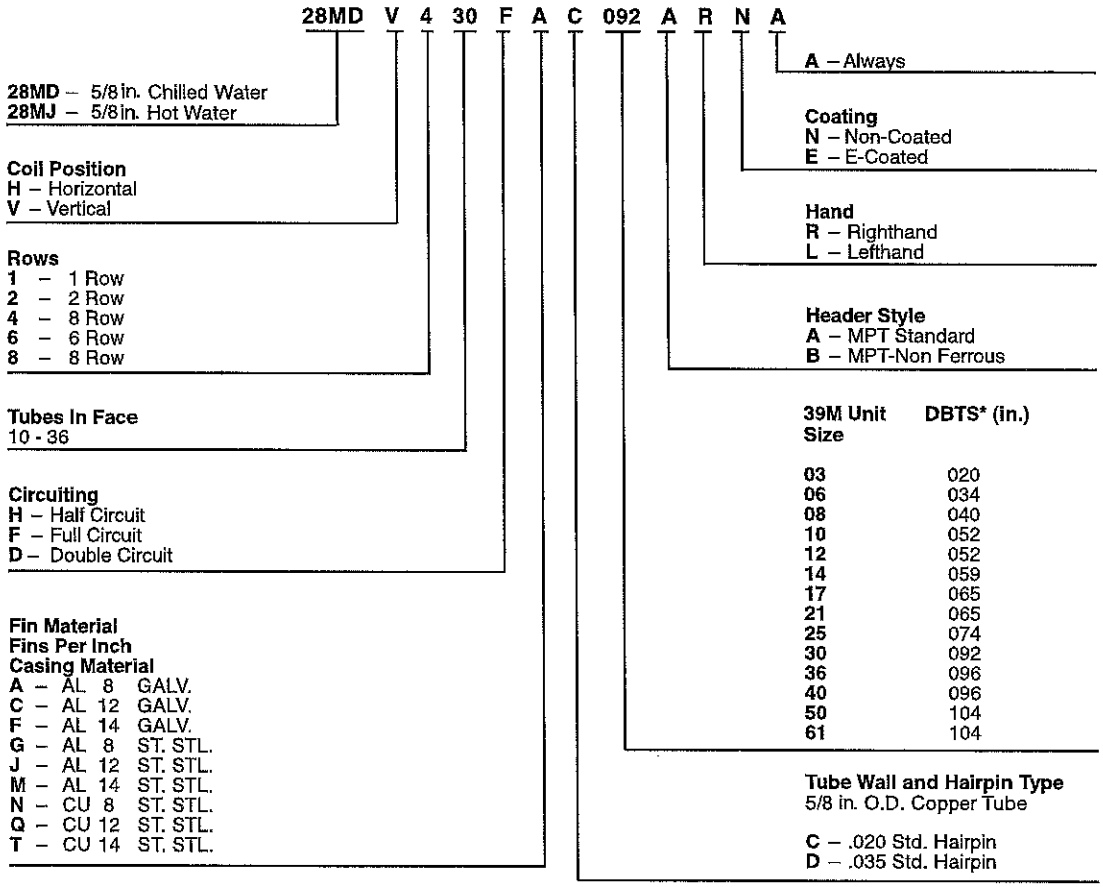


Fig. 2F — 28MG (Integral Face and Bypass Coil) Nomenclature

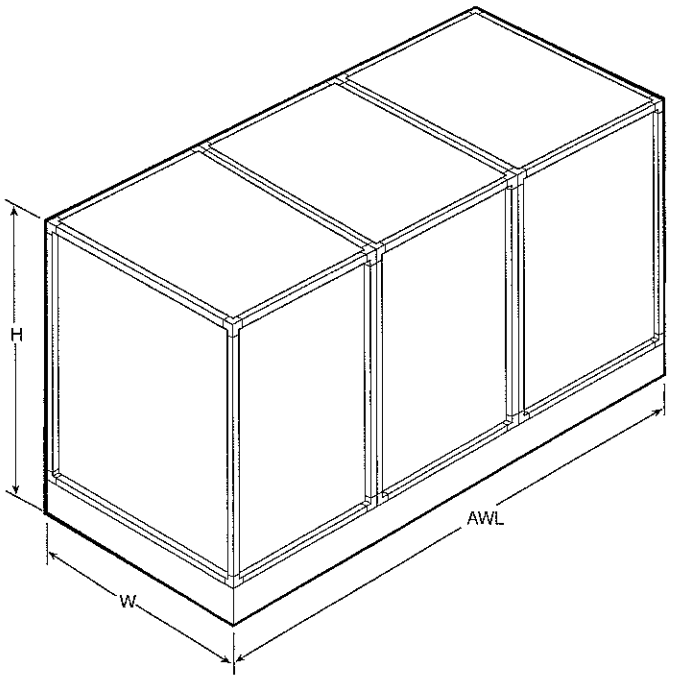


*Distance between tube sheets.

Fig. 2G — 28MD,28MJ ($^5/_8$-in. Water Coil) Nomenclature

39MN Indoor Unit Dimensions

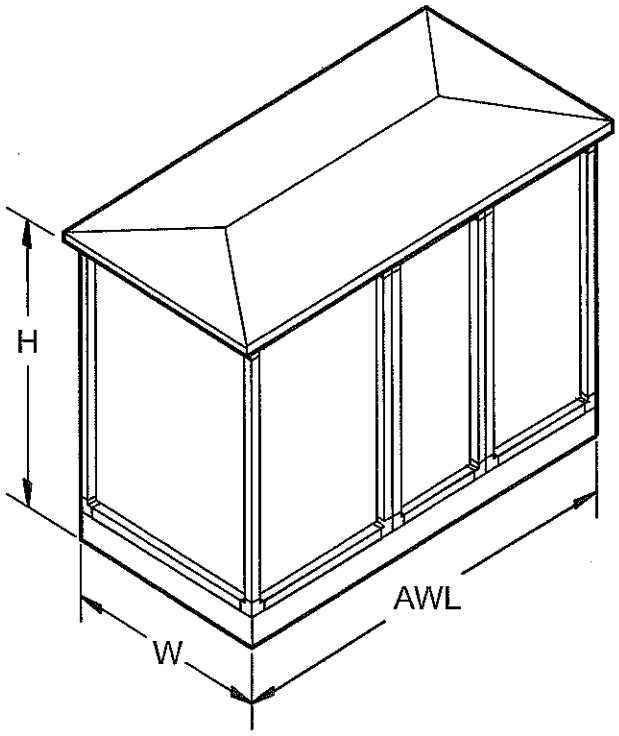
39MN UNIT SIZE	UNIT CASING	
	H (in.)	W (in.)
03	39	33
06	39	46
08	42	54
10	42	67
12	49	67
14	49	72
17	52	79
21	62	79
25	62	86
30	62	104
36	73	109
40	79	109
50	89	117
61	104	117



39MW Outdoor Unit Dimensions

39MN UNIT SIZE	UNIT CASING	
	H (in.)	W (in.)
03	43	36
06	43	49
08	46	57
10	46	70
12	53	70
14	53	75
17	56	82
21	66	82
25	66	89
30	66	107
36	77	112
40	83	112
50	93	120
61	108	120

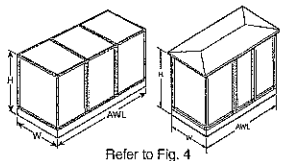
NOTES:
1. Weights and dimensions are approximate. For more exact dimensions, consult with your local Carrier Sales Engineer or select your desired unit using ***AHU*Builder®** software.
2. All dimensions in inches unless otherwise noted.



LEGEND
AWL — Airway Length
H — Height
W — Width

Fig. 3 — Base Unit Dimensions

Table 1 — 39MN,MW Component Weights and Lengths



Refer to Fig. 4

		Nominal cfm at 500 fpm	1500	3000	4000	5000	6000	7000	8500
		Unit Size	03	06	08	10	12	14	17
	H (in.)	Indoor	39	39	42	42	49	49	52
		Outdoor	43	43	46	46	53	53	56
	W (in.)	Indoor	33	46	54	67	67	72	79
		Outdoor	36	49	57	70	70	75	82
ITEM NO.	DESCRIPTION		AWL (in.) (Indoor/Outdoor) Weight (lb)						
1	Mixing box		18 270 / 370	21 330 / 450	21 370 / 510	21 420 / 570	21 460 / 610	24 520 / 690	24 570 / 750
2	Side inlet mixing box		21 300 / 410	27 360 / 490	27 390 / 540	33 470 / 650	33 510 / 690	39 580 / 780	39 640 / 860
3	Filter mixing box		36 320 / 450	36 380 / 530	36 430 / 590	36 490 / 680	36 540 / 730	36 570 / 770	36 630 / 840
4	Air mixer		18 170 / 270	18 190 / 310	18 210 / 340	24 270 / 430	24 290 / 450	24 300 / 470	30 380 / 570
5	Exhaust box		18 160 / 260	21 190 / 310	21 210 / 350	21 230 / 380	21 250 / 400	24 280 / 450	24 300 / 480
6	Side outlet exhaust box		21 300 / 410	27 360 / 490	27 390 / 540	33 470 / 650	33 510 / 690	39 580 / 780	39 640 / 860
7	Integral face and bypass heating coil section		48 250 / 400	48 280 / 450	48 310 / 500	48 340 / 560	48 360 / 580	48 380 / 610	48 410 / 650
8	Internal face and bypass damper section		18 130 / 230	18 150 / 270	18 170 / 300	18 190 / 340	18 200 / 350	18 210 / 360	18 230 / 390
9	External face and bypass damper section		18 140 / —	21 160 / —	21 180 / —	21 190 / —	21 200 / —	24 220 / —	24 240 / —
10	Plenum section — 12 in.		12 120 / 210	12 140 / 250	12 150 / 270	12 170 / 300	12 180 / 310	12 190 / 330	12 200 / 350
	Plenum section — 18 in.		18 140 / 240	18 160 / 280	18 180 / 310	18 190 / 340	18 210 / 360	18 210 /360	18 230 / 390
	Plenum section — 24 in.		24 170 / 280	24 190 / 320	24 210 / 350	24 230 / 390	24 240 / 400	24 250 / 420	24 270 / 450
	Plenum section — 36 in.		36 210 / 340	36 240 / 390	36 260 / 420	36 280 / 470	36 300 / 490	36 310 / 510	36 340 / 550
	Plenum section — 48 in.		48 250 / 400	48 280 / 450	48 310 / 500	48 340 / 560	48 360 / 580	48 380 / 610	48 410 / 650
11	Humidifier section — 24 in.		24 247 / 360	24 290 / 420	24 330 / 470	24 370 / 530	24 410 / 570	24 420 / 590	24 470 / 650
	Humidifier section — 36 in.		36 287 / 410	36 340 / 490	36 380 / 540	36 420 / 610	36 460 / 650	36 490 / 690	36 540 / 750
	Humidifier section — 48 in.		48 327 / 470	48 380 / 550	48 430 / 620	48 480 / 700	48 520 / 740	48 550 / 780	48 600 / 840
12	External bypass return section		18 140 / —	18 160 / —	18 170 / —	18 180 / —	18 190 / —	24 220 / —	24 240 / —
13	Horizontal blow-thru discharge plenum section		24 170 / 280	24 200 / 330	24 220 / 360	24 240 / 400	24 260 / 420	24 270 / 440	24 300 / 480
14	**Horizontal flat filter section** 2 in. or 4 in. side loading		12 190 / 280	12 230 / 340	12 260 / 380	12 300 / 430	12 330 / 460	12 340 / 480	12 380 / 530
15	**Horizontal angle filter section** 2 in. or 4 in. side loading		24 230 / 340	24 270 / 400	24 310 / 450	24 350 / 510	24 390 / 550	24 400 / 570	24 450 / 630
16	**Horizontal bag/cartridge filter section, SL** 6 in. or 12 in. media with 2 in. pre-filter track		24 230 / 340	24 270 / 400	24 310 / 450	24 350 / 510	24 390 / 550	24 400 / 570	24 450 / 630
	Horizontal bag/cartridge filter section, SL 15 in. or 30 in. media with 2 in. pre-filter track		42 300 / 440	42 350 / 510	42 390 / 570	42 440 / 640	42 480 / 680	42 500 / 710	42 560 / 780
17	**Horizontal bag/cartridge filter section, FL** Face loading media with or without header		48 320 / 470	48 370 / 540	48 420 / 610	48 470 / 690	48 510 / 730	48 540 / 770	48 590 / 830
18	**Horizontal blow-thru HEPA filter section, FL**		48 320 / 470	48 370 / 540	48 420 / 610	48 470 / 690	48 510 / 730	48 540 / 770	48 590 / 830
19	**Cooling coil section with drain pan**		24 170 / 280	24 190 / 320	24 210 / 350	24 230 / 390	24 240 / 400	24 250 / 420	24 270 / 450
20	**Extended length cooling coil section with drain pan**		42 230 / 370	42 260 / 420	42 290 / 470	42 310 / 510	42 340 / 540	42 350 / 560	42 380 / 600
21	**Heating coil section**		12 120 / 210	12 140 / 250	12 150 / 270	12 170 / 300	12 180 / 310	12 190 / 330	12 200 / 350
22	**Extended length heating coil section and electric heat with remote box**		24 170 / 280	24 190 / 320	24 210 / 350	24 230 / 390	24 240 / 400	24 250 / 420	24 270 / 450
23	**Extended length heating coil section with EBR**		36 200 / —	36 230 / —	36 250 / —	36 270 / —	42 310 / —	42 320 / —	42 350 / —
24	**Dual coil section with drain pan**		36 210 / 340	36 240 / 390	36 260 / 420	36 280 / 470	36 300 / 490	36 310 / 510	36 340 / 550
25	**Electric heat section with control box**	Low Amp (in.) (Indoor / Outdoor) (lb)	24/30 180 / 300	30/36 240 / 390	30/36 280 / 440	30/36 320 / 510	30/36 350 / 540	30/36 370 / 570	30/36 410 / 620
		High Amp (in.) (Indoor / Outdoor) (lb)	36/42 180 / 320	36/42 220 / 380	42/48 290 / 480	42/48 340 / 560	42/48 380 / 600	42/48 400 / 630	42/48 450 / 690
26	**Horizontal blow thru coil with ducted discharge**		30 200 / 320	30 220 / 360	30 250 / 400	30 270 / 440	36 320 / 510	36 330 / 530	36 370 / 580
27	**Multizone/dual duct heating/cooling coil section**	H (in.) AWL (in.) (Indoor / Outdoor) Weight (lb)	— — — / —	61 48 570 / —	64 48 620 / —	64 48 690 / —	71 60 820 / —	71 60 850 / —	74 60 920 / —
28	**Multizone damper section**	AWL Number of Zones	— —	11 6	11 7	11 10	11 10	11 10	11 12
29	**Vertical coil section with drain pan**		42 250 / —	42 290 / —	36 290 / —	36 320 / —	42 370 / —	48 420 / —	48 460 / —
30, 31, 32, 33, 34	Fan sections	FC	24 480 / 590	30 550 / 690	36 640 / 800	36 700 / 890	42 810 / 1010	48 910 / 1140	48 990 / 1230
		AF	42 550 / 690	42 620 / 780	36 640 / 800	36 700 / 890	42 810 / 1010	48 900 / 1130	48 990 / 1230
		Downblast AF	42 550 / 690	42 620 / 780	42 670 / 850	42 740 / 940	48 850 / 1070	54 940 / 1180	54 1030 / 1290
		Vertical FC/AF	42 560 / —	42 630 / —	36 660 / —	36 720 / —	42 840 / —	48 940 / —	48 1030 / —
35	**Plenum fan section**		48 600 / 770	54 720 / 900	42 720 / 900	42 800 / 1000	48 940 / 1160	48 980 / 1210	48 1080 / 1320

LEGEND

AF	— Airfoil	FL	— Face Load
AWL	— Airway Length	H	— Height
EBR	— External Bypass Return	SL	— Side Load
FC	— Forward Curved	W	— Width

NOTES:
1. Refer to the Aero™ Product Data Catalog for additional application information.
2. Section weights do not include coils or motors. Refer to the product data catalog for additional weights.
3. Section height is the same except as noted.
4. All bold numbers are inches, non-bold are pounds unless otherwise noted.

Table 2A — Physical Data — Airfoil Fans (Supply, Return and Exhaust)

39M UNIT SIZE	03	06	08	10	12	14	17	21	25	30
WHEEL TYPE...SIZE	All...Std	All...Std	All...Std	All...Std	All...Std	All...Std	All...Std	All...Std	All...Std	All...Std
WHEEL DIAMETER (in.)	10	12 1/4	13 1/2	13 1/2	16 1/2	16 1/2	18 1/4	20	22 1/4	22 1/4
MIN INLET CONE DIAMETER (in.)	6.13	7.5	8.38	8.38	10.13	10.13	11.00	12.44	13.88	13.88
MAX SPEED (rpm)										
Class I	N/A	N/A	N/A	N/A	N/A	N/A	2261	2019	1872	1872
Class II	4655	4560	4033	4033	3254	3254	2950	2598	2442	2442
FAN SHAFT DIAMETER (in.)										
Class I	N/A	N/A	N/A	N/A	N/A	N/A	1 11/16	1 11/16	1 15/16	1 15/16
Class II	1	1 3/16	1 7/16	1 7/16	1 11/16	1 11/16	1 15/16	1 15/16	2 3/16	2 3/16
FAN WHEEL WEIGHT (lb)										
Class I	N/A	N/A	N/A	N/A	N/A	N/A	51.7	59.6	73.0	73.0
Class II	7.5	10.50	15	15	36.5	36.5	51.7	59.6	73.0	73.0
No. Fan Blades	9	9	9	9	9	9	9	9	9	9
MOTOR FRAME SIZE										
Maximum (ODP/TEFC)	184T	184T	215T	254T	254T	256T	256T	284T	286T	324T
Minimum (ODP/TEFC)	56	56	143T	145T	145T	145T	145T	145T	145T	182T
MOTOR HP										
Maximum	5	7.5	10	15	15	20	20	25	30	40
Minimum	1/2	1/2	1	1 1/2	1 1/2	1 1/2	1 1/2	2	2	3

39M UNIT SIZE	36		40		50		61	
WHEEL TYPE...SIZE	Supply...Std	Ret/Exh...Std	Supply...Std	Ret/Exh...Std	Supply...Std	Ret/Exh...Std	Supply...Std	Ret/Exh...Std
WHEEL DIAMETER (in.)	24 1/2	27	27	30	30	33	33	36 1/2
MIN INLET CONE DIAMETER (in.)	15 1/8	16 13/16	16 13/16	18 13/16	18 13/16	20 9/16	20 9/16	23 1/8
MAX SPEED (rpm)								
Class I	1700	1463	1463	1316	1316	1202	1202	1055
Class II	2123	1910	1910	1715	1715	1568	1568	1378
FAN SHAFT DIAMETER (in.)								
Class I	2 3/16	2 3/16	2 3/16	2 7/16	2 7/16	2 7/16	2 7/16	2 11/16
Class II	2 7/16	2 7/16	2 7/16	2 11/16	2 11/16	2 3/16	2 3/16	2 3/16
FAN WHEEL WEIGHT (lb)								
Class I	88	104	104	136	136	168	168	235
Class II	91	106	106	145	145	176	176	233
No. Fan Blades	18	18	18	18	18	18	18	18
MOTOR FRAME SIZE								
Maximum (ODP/TEFC)	324T	254T	324T	254T	326T	256T	365T	256T
Minimum (ODP/TEFC)	184T	182T	184T	182T	213T	184T	213T	184T
MOTOR HP								
Maximum	50	15	50	15	60	20	75	20
Minimum	5	3	3	3	7 1/2	5	7 1/2	5

LEGEND

ODP — Open Dripproof
Ret/Exh — Return Exhaust
TEFC — Totally Enclosed Fan Cooled

NOTE: Data is for 50 Hz and 60 Hz motors.

Table 2C — Physical Data — Forward-Curved Fans (Supply)

39M UNIT SIZE	03	06	08		10		12		14		17		21	
WHEEL SIZE	Std	Std	Std	Small	Std	Small	Std	Small	Std	Small	Std	Small	Std	Small
WHEEL DIAMETER (in.)	9 1/2	10 5/8	12 5/8	10 5/8	15	12 5/8	15	12 5/8	18	15	18	15	20	15
MIN INLET CONE DIAMETER (in.)	7.81	8.81	10.38	8.81	12.12	10.38	12.62	10.38	15.5	12.62	15.5	12.62	16.25	12.62
MAX SPEED (rpm)														
Class I	2132	1806	1533	1806	1262	1533	1262	1491	1097	1262	1097	1262	952	1262
Class II	2749	2347	1986	2347	1639	1986	1639	1938	1378	1639	1378	1639	1239	1639
FAN SHAFT DIAMETER (in.)														
Class I	1	1	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 7/16	1 3/16	1 7/16	1 3/16	1 7/16	1 7/16	1 11/16
Class II	1	1	1 3/16	1 3/16	1 3/16	1 3/16	1 3/16	1 7/16	1 3/16	1 7/16	1 3/16	1 7/16	1 7/16	1 11/16
Fan Shaft Weight (lb) Class II	1.9	4.2	7.7	5.9	8.7	7.7	8.7	10.5	14.9	12.8	14.9	12.8	15.2	12.8
FAN WHEEL WEIGHT (lb)														
Class I	3.8	5.8	10.0	5.8	16.2	10.0	16.2	9.1	32.0	16.2	32.0	16.2	42.0	16.2
Class II	3.8	5.8	10.4	5.8	16.9	10.4	16.9	9.5	34.2	16.9	34.2	16.9	44.9	16.9
No. Fan Blades	43	48	43	48	51	43	51	43	48	51	48	51	51	51
MOTOR FRAME SIZE														
Maximum (ODP/TEFC)	184T	184T	213T	213T	213T	215T	213T	254T	213T	254T	215T	254T	254T	284T
Minimum (ODP/TEFC)	56	143T	143T	182T	145T	184T	145T	184T	145T	184T	182T	213T	182T	215T
MOTOR HP														
Maximum	3	5	5	7 1/2	5	10	7 1/2	15	7 1/2	15	10	15	15	25
Minimum	3/4	1	1	3	1 1/2	5	2	5	2	5	3	7 1/2	3	10

39M UNIT SIZE	25		30		36		40		50		61	
WHEEL SIZE	Std	Small	Std	Small	Std	Small	Std	Small	Std	Small	Std	Small
WHEEL DIAMETER (in.)	20	20	20	20	25	22 3/8	25	25	27 5/8	27 5/8	30 1/4	27 5/8
MIN INLET CONE DIAMETER (in.)	16.25	16.25	16.25	16.25	21 5/16	18 1/16	21 5/16	21 5/16	23 15/16	23 15/16	26 3/8	23 15/16
MAX SPEED (rpm)												
Class I	952	962	1217	969	751	884	751	770	656	684	618	656
Class II	1237	1250	1244	1238	960	1119	960	980	865	873	793	865
FAN SHAFT DIAMETER (in.)												
Class I	1 7/16	1 11/16	1 11/16	1 11/16	1 11/16	1 7/16	1 11/16	1 11/16	1 11/16	1 11/16	1 11/16	1 11/16
Class II	1 7/16	1 11/16	1 11/16	1 11/16	2 7/16	2 3/16	2 7/16	2 7/16	2 7/16	2 7/16	2 11/16	2 7/16
Fan Shaft Weight (lb) Class II	15.2	19.1	23.5	22.2	61.1	42.4	60.3	53.3	71.8	64.5	90.1	71.8
FAN WHEEL WEIGHT (lb)												
Class I	42.0	37.5	53.0	51.0	81.0	63.0	81.0	73.0	111.0	101.0	128.0	111.0
Class II	44.9	40.1	53.0	51.0	81.0	63.0	81.0	73.0	111.0	101.0	128.0	111.0
No. Fan Blades	51	51	37	37	37	37	37	37	37	37	37	37
MOTOR FRAME SIZE												
Maximum (ODP/TEFC)	254T	284T	256T	286T	256T	286T	284T	286T	286T	324T	324T	326T
Minimum (ODP/TEFC)	184T	215T	184T	215T	182T	254T	184T	254T	184T	254T	184T	256T
MOTOR HP												
Maximum	15	25	20	30	20	30	25	30	30	40	40	50
Minimum	5	10	5	10	3	15	5	15	5	15	5	20

LEGEND

ODP — Open Dripproof
TEFC — Totally Enclosed Fan Cooled

NOTE: Data is for 50 Hz and 60 Hz motors.

Table 3 — Coil Data

39M UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61
1/2-in. CHILLED WATER/DIRECT EXPANSION														
Large Face Area														
Nominal Capacity (cfm) at 500 fpm	1,736	2,951	3,819	4,965	6,319	7,170	8,464	10,720	12,205	15,174	18,333	20,000	25,278	30,694
Lower Coil Height (in.)	25	25	27.5	27.5	35	35	37.5	47.5	47.5	47.5	55	30	35	42.5
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	35	42.5
Length (in.)	20	34	40	52	52	59	65	65	74	92	96	96	104	104
Total Face Area (sq ft)	3.5	5.9	7.6	9.9	12.6	14.3	16.9	21.4	24.4	30.3	36.7	40.0	50.6	61.4
Medium Face Area														
Nominal Capacity (cfm) at 500 fpm	1,215	2,066	2,778	3,611	4,965	6,146	6,771	9,028	10,278	12,778	15,000	16,333	19,861	25,278
Lower Coil Height (in.)	17.5	17.5	20	20	27.5	30	30	40	40	40	45	55	55	35
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	35
Length (in.)	20	34	40	52	52	59	65	65	74	92	96	96	104	104
Total Face Area (sq ft)	2.4	4.1	5.6	7.2	9.9	12.3	13.5	18.1	20.6	25.6	30.0	36.7	39.7	50.6
Bypass Face Area (Internal Chilled Water Only)														
Nominal Capacity (cfm) at 500 fpm	1,042	1,771	2,431	3,160	4,514	5,122	6,207	7,899	8,993	11,181	12,500	15,000	16,250	19,861
Height (in.)	15	15	17.5	17.5	25	25	27.5	35	35	35	37.5	45	45	55
Length (in.)	20	34	40	52	52	59	65	65	74	92	96	96	104	104
Total Face Area (sq ft)	2.1	3.5	4.9	6.3	9.0	10.2	12.4	15.8	18.0	22.4	25.0	30.0	32.5	39.7
1/2-in. HOT WATER HEATING														
Large Face Area														
Nominal Capacity (cfm) at 700 fpm	2,431	4,132	5,347	6,951	8,847	10,038	11,849	15,009	17,087	21,243	25,667	28,000	35,389	42,972
Lower Coil Height (in.)	25	25	27.5	27.5	35	35	37.5	47.5	47.5	47.5	55	30	35	42.5
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	30	35	42.5
Length (in.)	20	34	40	52	52	59	65	65	74	92	96	96	104	104
Total Face Area (sq ft)	3.5	5.9	7.6	9.9	12.6	14.3	16.9	21.4	24.4	30.3	36.7	40.0	50.6	61.4
Medium Face Area														
Nominal Capacity (cfm) at 700 fpm	1,701	2,892	3,889	5,056	6,951	8,604	9,479	12,639	14,389	17,889	21,000	25,667	27,806	35,389
Lower Coil Height (in.)	17.5	17.5	20	20	27.5	30	30	40	40	40	45	55	55	35
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	35
Length (in.)	20	34	40	52	52	59	65	65	74	92	96	96	104	104
Total Face Area (sq ft)	2.4	4.1	5.6	7.2	9.9	12.3	13.5	18.1	20.6	25.6	30.0	36.7	39.7	50.6
Small Face Area														
Nominal Capacity (cfm) at 700 fpm	—	2,479	2,917	3,792	4,424	5,019	6,319	7,109	8,094	10,063	14,000	14,000	17,694	21,486
Height (in.)	—	15	15	15	17.5	17.5	20	22.5	22.5	22.5	30	30	35	42.5
Length (in.)	—	34	40	52	52	59	65	65	74	92	96	96	104	104
Total Face Area (sq ft)	—	3.5	4.2	5.4	6.3	7.2	9.0	10.2	11.6	14.4	20.0	20.0	25.3	30.7
Bypass Face Area (Internal)														
Nominal Capacity (cfm) at 700 fpm	1,458	2,479	3,403	4,424	6,319	7,170	8,689	11,059	12,590	15,653	17,500	21,000	22,750	27,806
Height (in.)	15	15	17.5	17.5	25	25	27.5	35	35	35	37.5	45	45	55
Length (in.)	20	34	40	52	52	59	65	65	74	92	96	96	104	104
Total Face Area (sq ft)	2.1	3.5	4.9	6.3	9.0	10.2	12.4	15.8	18.0	22.4	25.0	30.0	32.5	39.7
5/8-in. STEAM HEATING														
Large Face Area														
Nominal Capacity (cfm) at 700 fpm	2,333	3,967	5,250	6,825	8,342	9,466	11,375	14,219	16,188	—	—	—	—	—
Lower Coil Height (in.)	24	24	27	27	33	33	36	45	45	—	—	—	—	—
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	—	—	—	—	—
Length (in.)	20	34	40	52	52	59	65	65	74	—	—	—	—	—
Total Face Area (sq ft)	3.3	5.7	7.5	9.8	11.9	13.5	16.3	20.3	23.1	—	—	—	—	—
Medium Face Area														
Nominal Capacity (cfm) at 700 fpm	1,458	2,479	3,500	4,550	6,825	8,604	9,479	12,323	14,029	—	—	—	—	—
Lower Coil Height (in.)	15	15	18	18	27	30	30	39	39	—	—	—	—	—
Upper Coil Height (in.)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	—	—	—	—	—
Length (in.)	20	34	40	52	52	59	65	65	74	—	—	—	—	—
Total Face Area (sq ft)	2.1	3.5	5.0	6.5	9.8	12.3	13.5	17.6	20.0	—	—	—	—	—
Small Face Area														
Nominal Capacity (cfm) at 700 fpm	—	2,479	2,917	3,792	3,792	4,302	5,688	6,635	7,554	—	—	—	—	—
Height (in.)	—	15	15	15	15	15	18	21	21	—	—	—	—	—
Length (in.)	—	34	40	52	52	59	65	65	74	—	—	—	—	—
Total Face Area (sq ft)	—	3.5	4.2	5.4	5.4	6.1	8.1	9.5	10.8	—	—	—	—	—
Bypass Face Area (Internal)														
Nominal Capacity (cfm) at 700 fpm	1,458	2,479	2,917	3,792	6,067	6,883	8,531	10,427	11,871	—	—	—	—	—
Height (in.)	15	15	15	15	24	24	27	33	33	—	—	—	—	—
Length (in.)	20	34	40	52	52	59	65	65	74	—	—	—	—	—
Total Face Area (sq ft)	2.1	3.5	4.2	5.4	8.7	9.8	12.2	14.9	17.0	—	—	—	—	—

Table 4 — Direct-Expansion Circuiting Data

Medium Face Area Coils

39M UNIT SIZE	03			06			08			10			12			14		
CIRCUITING TYPE	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full
Airflow (cfm) at 500 fpm	1,215			2,066			2,778			3,611			4,965			6,146		
Total Face Area (sq ft)	2.4			4.1			5.6			7.2			9.9			12.3		
Tubes in Face	14	14	14	14	14	14	16	16	16	16	16	16	22	22	22	24	24	24
Tube Length (in.)	20	20	20	34	34	34	40	40	40	52	52	52	52	52	52	59	59	59
No. of Circuits - Total	4	7	14	4	7	14	4	8	16	4	8	16	6	11	22	6	12	24
4-Row Coil																		
Face Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	2	2	2	2	2	2
Suction Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	1 3/8	7/8	1 1/8	1 3/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 1/8	7/8	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5	—	G-1.5	G-2.5	—	G-2	G-4/G-3	E-12	G-2	G-4	C-12
Intertwined Row Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—
Suction Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	—	7/8	1 1/8	—
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—
Distributor Nozzle Size*	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5	—	G-1.5	G-2.5	—	G-2	G-4/G-3	—	G-2	G-4	—
Single-Circuit Coils																		
No. of TXVs	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	—	7/8	1 3/8	—
Distributor Nozzle Size	G-2.5	G-6	—	G-2.5	G-6	—	G-2.5	G-8	—	G-2.5	G-8	—	G-4	E-12	—	G-4	C-12	—
6-Row Coil																		
Face Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	2	2	2	2	2	2	2	—	2	2
Suction Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 1/8	7/8	7/8	1 1/8	7/8	1 1/8	1 3/8	—	1 1/8	1 3/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	7/8	7/8	7/8	7/8	7/8	7/8	1 1/8	—	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5	G-8	G-1.5	G-2.5	G-8	G-2	G-4/G-3	E-12	—	G-4	C-12
Intertwined Row Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—	—	2	2
Suction Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	1 3/8	—	1 1/8	1 3/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 1/8	—	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5/G-2	—	G-1.5	G-2.5	—	G-1.5	G-2.5	—	G-2	G-4/G-3	E-12	—	G-4	C-12
Single-Circuit Coils																		
No. of TXVs	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—	—	1	—
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	1 1/8	1 3/8	—	—	1 3/8	—
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	—	—	1 3/8	—
Distributor Nozzle Size	G-2.5	G-6	—	G-2.5	G-6	—	G-2.5	G-8	—	G-2.5	G-8	—	G-4	E-12	—	—	C-12	—
8-Row Coil																		
Face Split Coils																		
No. of TXVs	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8
Distributor Connections (in. OD)	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	—	7/8	1 3/8
Distributor Nozzle Size*	—	G-2.5/G-2	G-6	—	G-2.5/G-2	G-6	—	G-2.5	G-8	—	G-2.5	G-8	—	G-4/G-3	E-12	—	G-4	C-12
Intertwined Row Split Coils																		
No. of TXVs	—	2	—	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	—	7/8	—	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8
Distributor Connections (in. OD)	—	7/8	—	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	1 1/8	—	7/8	1 3/8
Distributor Nozzle Size*	—	G-2.5/G-2	—	—	G-2.5/G-2	G-6	—	G-2.5	G-8	—	G-2.5	G-8	—	G-4/G-3	E-12	—	G-4	C-12
Single-Circuit Coils																		
No. of TXVs	1	1	—	—	1	—	—	1	—	—	1	—	—	1	—	—	1	—
Suction Connections (in. OD)	7/8	1 1/8	—	—	1 1/8	—	—	1 1/8	—	—	1 1/8	—	—	1 3/8	—	—	1 3/8	—
Distributor Connections (in. OD)	7/8	7/8	—	—	7/8	—	—	7/8	—	—	7/8	—	—	1 1/8	—	—	1 3/8	—
Distributor Nozzle Size	G-2.5	G-6	—	—	G-6	—	—	G-8	—	—	G-8	—	—	E-12	—	—	C-12	—

LEGEND

TXV — Thermostatic Expansion Valve (Field Supplied)

*When 2 nozzle sizes are listed, the smaller nozzle should be located on the upper distributor.

NOTE: Factory-supplied distributors have factory-selected nozzle sizes as shown. If necessary, replace factory-supplied nozzles with field-supplied and installed nozzles. Consult ***AHU*Builder®** software selection program for correct nozzle selection.

Table 4 — Direct-Expansion Circuiting Data (cont)

Large Face Area Coil

39M UNIT SIZE	03			06			08			10			12			14		
CIRCUITING TYPE	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full	Quarter	Half	Full
Airflow (cfm) at 500 fpm	1,736			2,951			3,819			4,965			6,319			7,170		
Total Face Area (sq ft)	3.5			5.9			7.6			9.9			12.6			14.3		
Tubes in Face	20	20	20	20	20	20	22	22	22	22	22	22	28	28	28	28	28	28
Tube Length (in.)	20	20	20	34	34	34	40	40	40	52	52	52	52	52	52	59	59	59
No. of Circuits - Total	4	10	20	4	10	20	6	11	22	6	11	22	7	14	28	7	14	28
4-Row Coil																		
Face Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2		2	2	—	2	2	2	2	2	2
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	1 5/8	7/8	1 1/8	1 5/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 3/8	7/8	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-3		G-1.5	G-3	—	G-2	G-4/G-3	—	G-2	G-4/G-3	—	G-2.5/G-2	G-6	C-15	G-2.5/G-2	G-6	C-15
Intertwined Row Split Coils									—									
No. of TXVs	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—	7/8	7/8	—
Distributor Nozzle Size*	G-1.5	G-3	—	G-1.5	G-3	—	G-2	G-4/G-3	—	G-2	G-4/G-3	—	G-2.5/G-2	G-6	—	G-2.5/G-2	G-6	—
Single-Circuit Coils																		
No. of TXVs	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—	1	1	—
Suction Connections (in. OD)	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8	—
Distributor Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 3/8	—	7/8	1 3/8	—
Distributor Nozzle Size	G-3	E-10	—	G-3	E-10	—	G-4	E-12	—	G-4	E-12	—	G-6	C-15	—	G-6	C-15	—
6-Row Coil																		
Face Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	2	2	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	1 3/8	7/8	1 1/8	1 3/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 1/8	7/8	7/8	1 1/8	—	7/8	1 3/8	—	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-3	—	G-1.5	G-3	—	G-2	G-4/G-3	E-12	G-2	G-4/G-3	E-12	—	G-6	C-15	—	G-6	C-15
Intertwined Row Split Coils																		
No. of TXVs	2	2	—	2	2	—	2	2	2	2	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	1 3/8	7/8	1 1/8	1 3/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8
Distributor Connections (in. OD)	7/8	7/8	—	7/8	7/8	—	7/8	7/8	1 1/8	7/8	7/8	1 1/8	—	7/8	1 3/8	—	7/8	1 3/8
Distributor Nozzle Size*	G-1.5	G-3	—	G-1.5	G-3	—	G-2	G-4/G-3	E-12	G-2	G-4/G-3	E-12	—	G-6	C-15	—	G-6	C-15
Single-Circuit Coils																		
No. of TXVs	1	1	—	1	1	—	1	1	—	1	1	—	—	1	—	—	1	—
Suction Connections (in. OD)	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	—	1-5/8	—	—	1 5/8	—
Distributor Connections (in. OD)	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	—	1 3/8	—	—	1 3/8	—
Distributor Nozzle Size	G-3	E-10	—	G-3	E-10	—	G-4	E-12	—	G-4	E-12	—	—	C-15	—	—	C-15	—
8-Row Coil																		
Face Split Coils																		
No. of TXVs	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8
Distributor Connections (in. OD)	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 3/8	—	7/8	1 3/8
Distributor Nozzle Size*	—	G-3	E-10	—	G-3	E-10	—	G-4/G-3	E-12	—	G-4/G-3	E-12	—	G-6	C-15	—	G-6	C-15
Intertwined Row Split Coils																		
No. of TXVs	—	2	—	—	2	2	—	2	2	—	2	2	—	2	2	—	2	2
Suction Connections (in. OD)	—	1 1/8	—	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 3/8	—	1 1/8	1 5/8	—	1 1/8	1 5/8
Distributor Connections (in. OD)	—	7/8	—	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 1/8	—	7/8	1 3/8	—	7/8	1 3/8
Distributor Nozzle Size*	—	G-3	—	—	G-3	E-10	—	G-4/G-3	E-12	—	G-4/G-3	E-12	—	G-6	C-15	—	G-6	C-15
Single-Circuit Coils																		
No. of TXVs	—	1	—	—	1	—	—	1	—	—	1	—	—	1	—	—	1	—
Suction Connections (in. OD)	—	1 3/8	—	—	1 3/8	—	—	1 3/8	—	—	1 3/8	—	—	1 5/8	—	—	1 5/8	—
Distributor Connections (in. OD)	—	1 1/8	—	—	1 1/8	—	—	1 1/8	—	—	1 1/8	—	—	1 3/8	—	—	1 3/8	—
Distributor Nozzle Size	—	E-10	—	—	E-10	—	—	E-12	—	—	E-12	—	—	C-15	—	—	C-15	—

LEGEND

TXV — Thermostatic Expansion Valve (Field Supplied)

*When 2 nozzle sizes are listed, the smaller nozzle should be located on the upper distributor.

NOTE: Factory-supplied distributors have factory-selected nozzle sizes as shown. If necessary, replace factory-supplied nozzles with field-supplied and installed nozzles. Consult ***AHU*Builder®** software selection program for correct nozzle selection.

Table 5 — 1/2-in. Water Coil Connection Sizes

FACE AREA	ROWS	CIRCUIT TYPE	39M UNIT SIZE													
			03	06	08	10	12	14	17	21	25	30	36	40	50	61
			Nozzle Size (in. MPT)													
LARGE	1, 2	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	(2) 1.5	(2) 1.5	(2) 2.5
	4	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	(2) 1.5	(2) 1.5	(2) 2.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2) 2.5	(2) 2.5	(2) 2.5
	6, 8, 10	HALF/FULL	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5	3	(2) 1.5	(2) 2.5	(2) 2.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	(2) 2.5	(2) 2.5	(2) 3
MEDIUM	1, 2	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5	(2) 1.5
	4	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5	(2) 1.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2) 2.5
	6, 8, 10	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	3	3	(2) 2.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	3	3	(2) 2.5
BYPASS	1, 2	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5
	4	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	6, 8, 10	HALF/FULL	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3
SMALL	1, 2	HALF/FULL	—	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5
	4	HALF/FULL	—	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2.5
		DOUBLE	—	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

NOTE: Large face area sizes 40, 50 and 61 and medium face area size 61 units have 2 sets of water coil connections.

Table 6 — 5/8-in. Water Coil Connection Sizes

FACE AREA	ROWS	CIRCUIT TYPE	39M UNIT SIZE													
			03	06	08	10	12	14	17	21	25	30	36	40	50	61
			Nozzle Size (in. MPT)													
LARGE	1	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	(2) 1.5	(2) 1.5	(2) 1.5
	2, 4	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	(2) 1.5	(2) 1.5	(2) 2
		FULL	2	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2) 2	(2) 2.5	(2) 2.5
	6, 8	FULL	2	2	2	2	2.5	2.5	2.5	3	3	3	3	(2) 2	(2) 2.5	(2) 2.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	(2) 2.5	(2) 2.5	(2) 2.5
MEDIUM	1	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	(2) 1.5
	2, 4	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	(2) 1.5
		FULL	1.5	1.5	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	(2) 2
	6, 8	FULL	1.5	1.5	2	2	2	2.5	2.5	2.5	2.5	2.5	3	3	3	(2) 2.5
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	(2) 2.5
BYPASS	1	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	2, 4	HALF	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2	2	2
		FULL	1.5	1.5	1.5	1.5	2	2	2	2.5	2.5	2.5	2.5	2.5	2.5	2.5
	6, 8	FULL	1.5	1.5	1.5	1.5	2	2	2	2.5	2.5	2.5	2.5	3	3	3
		DOUBLE	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3
SMALL	1	HALF	—	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
	2	HALF	—	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	2
		FULL	—	1.5	1.5	1.5	1.5	1.5	2	2	2	2	2	2	2	2

NOTE: Large face area sizes 40, 50 and 61 and medium face area size 61 units have 2 sets of water coil connections.

Table 7 — 1-in. Steam Coil Connection Sizes

FACE AREA	ROWS	CONNECTION	39M UNIT SIZE													
			03	06	08	10	12	14	17	21	25	30	36	40	50	61
			Nozzle Size (in. MPT)													
ALL*	ALL	INLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
		OUTLET	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5

*Large face area sizes 40, 50 and 61 and medium face area size 61 units have 2 sets of steam coil connections.

Table 12 — Coil Volume (Gal. Water)

39M UNIT SIZE	03	06	08	10	12	14	17	21	25	30	36	40	50	61
CHILLED WATER														
Large Face Area														
4-Row	1.4	2.2	2.8	3.7	4.7	5.3	6.2	7.8	8.9	11.0	13.3	14.5	18.3	22.2
6-Row	2.0	3.3	4.3	5.5	7.0	7.9	9.3	11.8	13.3	16.5	19.9	21.7	27.4	33.3
8-Row	2.7	4.4	5.7	7.3	9.3	10.5	12.4	15.7	17.8	22.0	26.5	29.0	36.5	44.4
10-Row	3.4	5.5	7.1	9.1	11.6	13.1	15.5	19.6	22.2	27.5	33.2	36.2	45.7	55.5
Medium Face Area														
4-Row	0.9	1.5	2.1	2.7	3.7	4.5	4.9	6.6	7.5	9.3	10.9	13.3	14.4	18.3
6-Row	1.4	2.3	3.1	4.0	5.5	6.8	7.4	9.9	11.2	13.9	16.3	19.9	21.5	27.4
8-Row	1.9	3.1	4.1	5.3	7.3	9.0	9.9	13.2	15.0	18.5	21.7	26.5	28.7	36.5
10-Row	2.4	3.9	5.2	6.6	9.1	11.3	12.4	16.5	18.7	23.1	27.1	33.2	35.9	45.7
Small Face Area														
4-Row	—	1.3	1.5	2.0	2.3	2.6	3.3	3.7	4.2	5.2	7.2	7.2	9.1	11.1
Bypass Face Area														
4-Row	0.8	1.3	1.8	2.3	3.3	3.8	4.5	5.8	6.5	8.1	9.0	10.9	11.7	14.4
6-Row	1.2	2.0	2.7	3.5	5.0	5.6	6.8	8.7	9.8	12.2	13.6	16.3	17.6	21.5
8-Row	1.6	2.7	3.6	4.7	6.6	7.5	9.1	11.5	13.1	16.2	18.1	21.7	23.5	28.7
10-Row	2.0	3.3	4.5	5.8	8.3	9.4	11.3	14.4	16.4	20.3	22.6	27.1	29.4	35.9
HOT WATER														
Large Face Area														
1-Row	0.3	0.6	0.7	0.9	1.2	1.3	1.5	2.0	2.2	2.7	3.3	3.6	4.6	5.5
2-Row	0.7	1.1	1.4	1.8	2.3	2.6	3.1	3.9	4.4	5.5	6.6	7.2	9.1	11.1
Medium Face Area														
1-Row	0.2	0.4	0.5	0.7	0.9	1.1	1.2	1.6	1.9	2.3	2.7	3.3	3.6	4.6
2-Row	0.5	0.8	1.0	1.3	1.8	2.3	2.5	3.3	3.7	4.6	5.4	6.6	7.2	9.1
Small Face Area														
1-Row	—	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.1	1.3	1.8	1.8	2.3	2.8
2-Row	—	0.7	0.8	1.0	1.2	1.3	1.6	1.9	2.1	2.6	3.6	3.6	4.6	5.5
Bypass Face Area														
1-Row	0.2	0.3	0.5	0.6	0.8	0.9	1.1	1.4	1.6	2.0	2.3	2.7	2.9	3.6
2-Row	0.4	0.7	0.9	1.2	1.7	1.9	2.3	2.9	3.3	4.1	4.5	5.4	5.9	7.2
Integral Bypass Face Area														
1-Row	—	0.3	0.5	0.6	0.6	0.7	0.6	0.8	0.8	1.2	1.6	1.8	2.4	3.0
2-Row	—	0.6	0.9	1.2	1.2	1.4	1.2	1.7	1.7	2.3	3.2	3.6	4.8	5.9
3-Row	—	0.8	1.4	1.8	1.8	2.0	1.9	2.5	2.5	3.5	4.7	5.3	7.1	8.9

NOTE: One gallon of water weighs 8.33 lb.

Table 13 — Dry Coil Weights (lb) (cont)

COIL TYPE	FACE AREA	ROWS	FPI	39M UNIT SIZE													
				03	06	08	10	12	14	17	21	25	30	36	40	50	61
5/8-IN. IDT STEAM	LARGE	1	6	19	32	41	53	68	77	91	115	132	163	197	215	272	330
			9	19	33	43	56	71	80	95	120	137	170	205	224	283	344
			12	20	35	44	58	74	84	99	125	143	177	214	233	294	358
		2	6	23	40	51	67	85	96	114	144	165	204	246	269	340	413
			9	24	41	53	70	88	100	118	150	171	212	257	280	354	430
			12	25	43	56	72	92	104	123	156	178	221	267	291	368	447
	MEDIUM	1	6	13	22	30	39	53	66	73	97	111	137	161	197	214	272
			9	14	23	31	40	56	69	76	101	115	143	168	205	222	283
			12	14	24	32	42	58	72	79	105	120	149	175	214	231	294
		2	6	16	28	37	49	67	83	91	121	138	172	202	246	267	340
			9	17	29	39	51	70	86	95	126	144	179	210	257	278	354
			12	18	30	40	53	72	89	99	131	150	186	218	267	289	368
	SMALL	1	6	—	19	22	29	34	39	49	55	62	77	108	108	136	165
			9	—	20	23	30	35	40	51	57	65	81	112	112	142	172
			12	—	21	24	32	37	42	53	59	67	84	116	116	147	179
		2	6	—	24	28	36	42	48	61	68	78	97	134	134	170	206
			9	—	25	29	38	44	50	63	71	81	101	140	140	177	215
			12	—	26	30	39	46	52	66	74	84	105	146	146	184	223
	BYPASS	1	6	11	19	26	34	49	55	67	85	97	120	134	161	175	214
			9	12	20	27	35	51	57	70	88	101	125	140	168	182	222
			12	12	21	28	37	53	60	72	92	105	130	146	175	189	231
		2	6	14	24	33	42	61	69	83	106	121	150	168	202	218	267
			9	15	25	34	44	63	72	87	111	126	157	175	210	228	278
			12	15	26	35	46	66	75	90	115	131	163	182	218	237	289
HOT WATER OR STEAM	INEGRAL FACE AND BYPASS	1	6	—	146	207	216	216	231	507	567	567	723	828	880	1064	1210
			9	—	152	216	225	225	241	528	590	590	754	862	917	1108	1260
			12	—	158	225	234	234	251	550	615	615	785	898	955	1154	1313
		2	6	—	152	220	228	228	246	536	607	607	779	904	967	1180	1355
			9	—	158	229	238	238	256	559	633	633	811	1007	1007	1229	1411
			12	—	164	238	248	248	266	582	659	659	845	1049	1049	1280	1470
		3	6	—	158	231	241	241	259	585	668	668	863	1008	1081	1327	1532
			9	—	165	241	251	251	270	610	696	696	899	1050	1126	1382	1596
			12	—	172	251	261	261	281	635	725	725	936	1094	1173	1440	1662

LEGEND

FPI — Fin per Inch
IDT — Inner Distributing Tube

NOTES:
1. Weights shown include headers and are the sum of two coils where applicable.
2. Coils are full length.
3. Weights shown are for aluminum fin coils; for copper fin coils, multiply by 1.20.
4. Weights shown are for 1/2-in., .016 in. wall tubes; for 1/2-in., .025-in. wall tubes, multiply by 1.15.
5. Weights shown are for 1/2-in., .016-in. wall tubes; for 5/8-in., .020-in. wall tubes, multiply by 1.15.
6. Weights shown are for 1/2-in., .016-in. wall tubes; for 5/8-in., .035-in. wall tubes, multiply by 1.50.

Table 14 — Motor Weights (lb)

HP	200-230,460-3-60				200/400-3-50*		575-3-60	
	ODP		TEFC		ODP	TEFC	ODP	TEFC
	E+	E+3	E+	E+3			E+	E+/E+3
1/2	36	40	60	68	29	34	37	60/ 68
3/4	36	40	60	68	29	34	37	60/ 68
1	36	40	60	68	29	34	37	60/ 68
1 1/2	42	46	60	66	36	41	48	60/ 66
2	42	54	65	66	41	47	50	65/ 66
3	67	87	81	92	73	62	70	87
5	78	94	89	99	102	72	88	89/ 99
7 1/2	106	130	142	158	121	105	89	142/158
10	118	126	154	200	139	128	119	154/200
15	170	217	250	259	170	210	170	250/259
20	212	250	287	290	205	254	212	287/290
25	240	309	394	358	273	363	240	394/368
30	283	300	436	436	283	414	284	436/436
40	372	415	661	661	416†	470†	370	661/661
50	440	414	686	686	403†	527†	440	686/686
60	591	652**	790	799	545	790†	591	799
75	620	706**	840	850**	651†	884†	670	850

LEGEND

ODP — Open Drip Proof
TEFC — Totally Enclosed Fan Cooled
E+ — High Efficiency
E+3 — Premium Efficiency

*Both ODP and TEFC 50 Hz motors available in standard models only.

†Availability unconfirmed.
**460 volt only.

NOTES:
1. Multiply motor weight by 0.10 to estimate drive weight.
2. Motor weight may vary by manufacturer.

Table 15 — Forward-Curved Fan Drive Centerline Distances In Inches (cont)

39M UNIT SIZE	SUPPLY	RETURN/ EXHAUST	MOTOR FRAME	BHF/BHR		DBF/DBR		THF/THR		UBF/UBR	
				Min	Max	Min	Max	Min	Max	Min	Max
21	Std	Std	145T	24.7	26.0	14.6	16.4	17.4	19.1	18.6	20.0
			182T	23.9	25.1	14.0	15.8	16.7	18.5	17.8	19.2
			184T	23.9	25.1	14.0	15.8	16.7	18.5	17.8	19.2
			213T	23.2	24.6	13.5	15.4	16.2	18.1	17.2	18.7
			215T	23.2	24.6	13.5	15.4	16.2	18.1	17.2	18.7
			254T	22.4	23.8	13.0	14.9	15.6	17.5	16.4	18.0
	Small	N/A	215T	19.9	21.3	15.6	17.3	17.4	19.0	16.6	18.2
			254T	19.3	20.8	15.4	17.1	17.1	18.8	16.2	17.8
			256T	19.3	20.8	15.4	17.1	17.1	18.8	16.2	17.8
			284T	18.9	20.5	15.2	17.0	16.9	18.6	15.9	17.6
25	Std	Std	145T	32.4	34.1	24.1	26.2	27.4	29.5	26.6	28.5
			182T	31.7	33.5	23.7	25.9	27.0	29.1	26.1	28.0
			184T	31.7	33.5	23.7	25.9	27.0	29.1	26.1	28.0
			213T	31.3	33.1	23.5	25.6	26.7	28.8	25.7	27.7
			215T	31.3	33.1	23.5	25.6	26.7	28.8	25.7	27.7
			254T	30.7	32.5	23.2	25.4	26.4	28.5	25.2	27.2
	Small	N/A	215T	31.3	33.1	23.5	25.6	26.7	28.8	25.7	27.7
			254T	30.7	32.5	23.2	25.4	26.4	28.5	25.2	27.2
			256T	30.7	32.5	23.2	25.4	26.4	28.5	25.2	27.2
			284T	30.2	32.1	23.0	25.2	26.1	28.3	24.9	26.9
30	Std	Std	182T	31.7	33.5	23.7	25.9	27.0	29.1	26.6	28.5
			184T	31.7	33.5	23.7	25.9	27.0	29.1	26.1	28.0
			213T	31.3	33.1	23.5	25.6	26.7	28.8	26.1	28.0
			215T	31.3	33.1	23.5	25.6	26.7	28.8	25.7	27.7
			254T	30.7	32.5	23.2	25.4	26.4	28.5	25.7	27.7
			256T	30.7	32.5	23.2	25.4	26.4	28.5	25.2	27.2
	Small	N/A	215T	31.3	33.1	23.5	25.6	26.7	28.8	25.7	27.7
			254T	30.7	32.5	23.2	25.4	26.4	28.5	25.2	27.2
			256T	30.7	32.5	23.2	25.4	26.4	28.5	25.2	27.2
			284T	30.2	32.1	23.0	25.2	26.1	28.3	24.9	26.9
			286T	30.2	32.1	23.0	25.2	26.1	28.3	24.9	26.9
36	Std	Std	182T	31.1	33.3	23.0	25.7	25.6	28.2	27.0	29.4
			184T	31.1	33.3	23.0	25.7	25.6	28.2	27.0	29.4
			213T	30.4	32.6	22.5	25.3	25.0	27.7	26.4	28.8
			215T	30.4	32.6	22.5	25.3	25.0	27.7	26.4	28.8
			254T	29.7	31.9	22.1	24.9	24.5	27.2	25.7	28.2
			256T	29.7	31.9	22.1	24.9	24.5	27.2	25.7	28.2
	Small	N/A	254T	28.8	31.3	23.6	26.5	24.9	27.7	26.0	28.7
			256T	28.8	31.3	23.6	26.5	24.9	27.7	26.0	28.7
			284T	28.4	30.9	23.3	26.3	24.6	27.4	25.7	28.4
			286T	28.4	30.9	23.3	26.3	24.6	27.4	25.7	28.4
40	Std	Std	184T	31.1	33.3	23.0	25.7	25.6	28.2	27.0	29.4
			213T	30.4	32.6	22.5	25.3	25.0	27.7	26.4	28.8
			215T	30.4	32.6	22.5	25.3	25.0	27.7	26.4	28.8
			254T	29.7	31.9	22.1	24.9	24.5	27.2	25.7	28.2
			256T	29.7	31.9	22.1	24.9	24.5	27.2	25.7	28.2
			284T	29.2	31.5	21.8	24.7	24.1	26.9	25.3	27.8
	Small	N/A	254T	29.7	31.9	22.1	24.9	24.5	27.2	25.7	28.2
			256T	29.7	31.9	22.1	24.9	24.5	27.2	25.7	28.2
			284T	29.2	31.5	21.8	24.7	24.1	26.9	25.3	27.8
			286T	29.2	31.5	21.8	24.7	24.1	26.9	25.3	27.8
50	Std	Std	184T	33.5	35.5	24.2	26.8	27.1	29.6	28.9	31.1
			213T	32.7	34.8	23.7	26.3	26.5	29.1	28.2	30.5
			215T	32.7	34.8	23.7	26.3	26.5	29.1	28.2	30.5
			254T	31.9	34.1	23.2	25.9	26.0	28.5	27.5	29.8
			256T	31.9	34.1	23.2	25.9	26.0	28.5	27.5	29.8
			284T	31.4	33.6	22.8	25.6	25.5	28.2	27.0	29.4
			286T	31.4	33.6	22.8	25.6	25.5	28.2	27.0	29.4
	Small	N/A	254T	31.9	34.1	23.2	25.9	26.0	28.5	27.5	29.8
			256T	31.9	34.1	23.2	25.9	26.0	28.5	27.5	29.8
			284T	31.4	33.6	22.8	25.6	25.5	28.2	27.0	29.4
			286T	31.4	33.6	22.8	25.6	25.5	28.2	27.0	29.4
			324T	30.7	32.9	22.4	25.2	25.0	27.7	26.3	28.8
61	Std	Std	213T	35.6	37.6	25.3	28.0	29.1	31.6	30.4	32.7
			215T	35.6	37.6	25.3	28.0	29.1	31.6	30.4	32.7
			254T	34.8	36.9	24.8	27.5	28.5	31.0	29.7	32.0
			256T	34.8	36.9	24.8	27.5	28.5	31.0	29.7	32.0
			284T	34.3	36.4	24.4	27.2	28.0	30.6	29.2	31.6
			286T	34.3	36.4	24.4	27.2	28.0	30.6	29.2	31.6
			324T	33.5	35.7	24.0	26.8	27.5	30.1	28.6	30.9
	Small	N/A	256T	34.0	36.3	25.8	28.6	28.5	31.2	29.8	32.2
			284T	33.5	35.8	25.5	28.4	28.1	30.8	29.3	31.8
			286T	33.5	35.8	25.5	28.4	28.1	30.8	29.3	31.8
			324T	32.8	35.2	25.1	28.0	27.6	30.4	28.7	31.3
			326T	32.8	35.2	25.1	28.0	27.6	30.4	28.7	31.3

LEGEND

BHF — Bottom Horizontal Front
BHR — Bottom Horizontal Rear
DBF — Downblast Front
DBR — Downblast Rear
THF — Top Horizontal Front
THR — Top Horizontal Rear
UBF — Upblast Front
UBR — Upblast Rear

Table 16 — Airfoil Fan Drive Centerline Distances In Inches (cont)

39M UNIT SIZE	SUPPLY	RETURN/ EXHAUST	MOTOR FRAME	BHF/BHR		DBF/DBR		THF/THR		UBF/UBR	
				Min	Max	Min	Max	Min	Max	Min	Max
30	STD	STD	182T	27.4	28.9	24.2	25.8	24.1	25.7	27.4	28.9
			184T	27.4	28.9	24.2	25.8	24.1	25.7	27.4	28.9
			213T	26.9	28.4	23.7	25.5	23.7	25.5	26.9	28.4
			215T	26.9	28.4	23.7	25.5	23.7	25.5	26.9	28.4
			254T	26.1	27.7	23.1	25.0	23.1	24.9	26.1	27.7
			256T	26.1	27.7	23.1	25.0	23.1	24.9	26.1	27.7
			284T	25.6	27.3	22.7	24.5	22.6	24.6	25.6	27.3
			286T	25.6	27.3	22.7	24.5	22.6	24.6	25.6	27.3
			324T	24.9	26.7	22.1	24.0	22.1	24.2	25.0	26.7
36	STD	N/A	184T	26.0	27.3	20.2	22.9	20.2	22.0	24.3	25.7
			213T	25.4	26.7	19.7	22.5	19.7	21.6	23.7	25.2
			215T	25.4	26.7	19.7	22.5	19.7	21.6	23.7	25.2
			254T	24.6	25.9	19.0	21.9	19.0	21.0	22.9	24.4
			256T	24.6	25.9	19.0	21.9	19.0	21.0	22.9	24.4
			284T	23.9	25.4	18.5	21.4	18.5	20.5	22.3	23.9
			286T	23.9	25.4	18.5	21.4	18.5	20.5	22.3	23.9
			324T	23.1	24.6	17.8	20.9	17.8	20.0	21.5	23.2
			326T	23.1	24.6	17.8	20.9	17.8	20.0	21.5	23.2
	N/A	STD	182T	28.6	29.7	N/A	N/A	22.2	23.9	27.0	28.1
			184T	28.6	29.7	N/A	N/A	22.2	23.9	27.0	28.1
			213T	27.9	29.1	N/A	N/A	21.6	23.4	26.4	28.5
			215T	27.9	29.1	N/A	N/A	21.6	23.4	26.4	28.5
			254T	27.1	28.3	N/A	N/A	20.9	22.7	25.5	27.7
40	STD	N/A	184T	30.5	32.3	24.6	26.8	24.6	26.8	24.6	27.0
			213T	29.9	31.7	24.1	26.3	24.1	26.3	24.1	26.5
			215T	29.9	31.7	24.1	26.3	24.1	26.3	24.1	26.5
			254T	29.1	31.0	23.5	25.8	23.5	25.8	23.5	25.9
			256T	29.1	31.0	23.5	25.8	23.5	25.8	23.5	25.9
			284T	28.5	30.4	23.0	25.3	23.0	25.3	23.0	25.1
			286T	28.5	30.4	23.0	25.3	23.0	25.3	23.0	25.1
			324T	27.7	29.7	22.4	24.8	22.4	24.8	22.4	25.0
			326T	27.7	29.7	22.4	24.8	22.4	24.8	22.4	25.0
	N/A	STD	182T	30.9	32.1	N/A	N/A	24.3	26.0	30.1	31.3
			184T	30.9	32.1	N/A	N/A	24.3	26.0	30.1	31.3
			213T	30.3	31.4	N/A	N/A	23.7	25.5	29.4	30.7
			215T	30.3	31.4	N/A	N/A	23.7	25.5	29.4	30.7
			254T	29.4	30.6	N/A	N/A	23.0	24.8	28.5	29.8
50	STD	N/A	213T	32.9	34.5	24.5	27.0	27.0	29.1	32.1	33.8
			215T	32.9	34.5	24.5	27.0	27.0	29.1	32.1	33.8
			254T	32.1	33.8	24.0	26.4	26.3	28.5	31.3	33.0
			256T	32.1	33.8	24.0	26.4	26.3	28.5	31.3	33.0
			284T	31.5	33.2	23.6	26.1	25.8	28.1	30.7	32.4
			286T	31.5	33.2	23.6	26.1	25.8	28.1	30.7	32.4
			324T	30.7	32.5	23.0	25.6	25.2	27.5	29.9	31.8
			326T	30.7	32.5	23.0	25.6	25.2	27.5	29.9	31.8
			364T	30.4	31.8	22.5	25.2	24.6	27.0	29.2	31.1
	N/A	STD	184T	34.8	36.0	N/A	N/A	27.3	29.0	33.9	35.1
			213T	34.1	35.3	N/A	N/A	26.7	28.4	33.3	34.5
			215T	34.1	35.3	N/A	N/A	26.7	28.4	33.3	34.5
			254T	33.2	34.5	N/A	N/A	25.9	27.7	32.4	33.7
			256T	33.2	34.5	N/A	N/A	25.9	27.7	32.4	33.7
61	STD	N/A	213T	37.4	39.0	28.1	29.1	30.9	33.0	35.8	38.4
			215T	37.4	39.0	28.1	29.1	30.9	33.0	35.8	38.4
			254T	36.6	38.3	27.5	28.5	30.2	32.3	35.0	37.6
			256T	36.6	38.3	27.5	28.5	30.2	32.3	35.0	37.6
			284T	36.1	37.8	27.1	28.1	29.7	31.9	34.4	37.1
			286T	36.1	37.8	27.1	28.1	29.7	31.9	34.4	37.1
			324T	35.3	37.0	26.5	27.6	29.0	31.3	33.6	36.3
			326T	35.3	37.0	26.5	27.6	29.0	31.3	33.6	36.3
			364T	34.5	36.3	26.0	27.1	28.4	30.8	32.9	35.6
			365T	34.5	36.3	26.0	27.1	28.4	30.8	32.9	35.6
	N/A	STD	184T	40.0	41.4	N/A	N/A	31.0	33.2	38.3	39.5
			213T	39.1	40.7	N/A	N/A	30.3	32.7	37.4	38.6
			215T	39.1	40.7	N/A	N/A	30.3	32.7	37.4	38.6
			254T	38.2	39.9	N/A	N/A	29.5	33.0	36.5	37.8
			256T	38.2	39.9	N/A	N/A	29.5	33.0	36.5	37.8

LEGEND

BHF — Bottom Horizontal Front
BHR — Bottom Horizontal Rear
DBF — Downblast Front
DBR — Downblast Rear
THF — Top Horizontal Front
THR — Top Horizontal Rear
UBF — Upblast Front
UBR — Upblast Rear

PRE-INSTALLATION

Inspection — Inspect the unit; file a claim with the shipping company if the unit is damaged. Check the packing list to ensure that the correct items have been received and notify your Carrier representative of any discrepancy.

Rigging and Handling — To transfer the unit from the shipping platform to the storage or installation site, **refer to the rigging label** on the unit and these instructions.

⚠ CAUTION

A forklift truck can be used to move units or components only if they have full skids. Lift from the heavy end of the skid. Minimum recommended fork length is 48 inches. Failure to follow these safety precautions could lead to personal injury and/or equipment damage.

Base units are shipped fully assembled, except when sections are separately ordered or when the unit height exceeds 108 in. or length exceeds 30 feet. All 39M units can be rigged using the lifting brackets, as shown on the rigging label on the unit.

Aero™ connect latches or screws are provided at specified sections to separate component sections:

1. Undo all fasteners (with red hex heads) on vertical and horizontal (side and top) seams.
2. Remove the large through-bolts in adjacent lifting brackets and smaller bolts that hold lifting brackets together.
3. Lift the unit with slings and header bars, using clevises and pins in the large round holes in the unit's lifting brackets.
4. When the unit is in its final location, do not remove the caps from the coil connections until the coil is ready for piping. Do not remove grease from the fan shaft until the drive sheave is ready for installation.

Long-Term Storage — Store unit in a clean, dry place and protect it from weather and construction traffic.

1. The storage site should be level, rigid, and free of debris. If the site is in a heavy rain area, set the unit off of the ground.
2. Do not store the unit in a heavy traffic area or on a vibrating surface. Vibration can damage stationary bearings.
3. Ensure that all coil connections have shipping caps in place. Cover the entire unit with a waterproof tarpaulin or plastic coverall; if the unit is stored on the ground, extend the cover underneath the unit. Secure the cover with tiedowns. Do not remove cover or coil end caps until unit is ready for final installation.
4. Monthly — Move the coverall, enter the fan section through the access door or fan inlet, and slowly rotate the fan and motor by hand. This operation prevents bearing corrosion by redistributing the bearing grease.

Service Clearance — When planning the placement of the unit, ensure adequate space for service access. Typical service operations can require removing the coils and filters and accessing the motor and damper linkage. Refer to *AHU*Builder® program for recommended clearances.

Drain Positioning — To prevent build-up of condensate in the drain pan and ensure proper operation of the drain system, position the unit so that condensate drain can be properly trapped. Refer to the Condensate Drain section on page 72 in the Installation section.

Unit Suspension — Unit suspension methods are shown in Fig. 5-7. A field-supplied platform mount is recommended, especially for larger unit sizes. An inline twin-beam mount is also recommended. Units can also be supported by attaching suspension rods to all of the lifting brackets on all of the unit sections that have more than 15 in. of airway length with legs positioned as shown in Fig. 8, or by suspending the unit from cross-beams at the joint between each unit component. Ensure that suspension rods are secured to adequately support the unit and that the rods extend entirely through their associated fasteners.

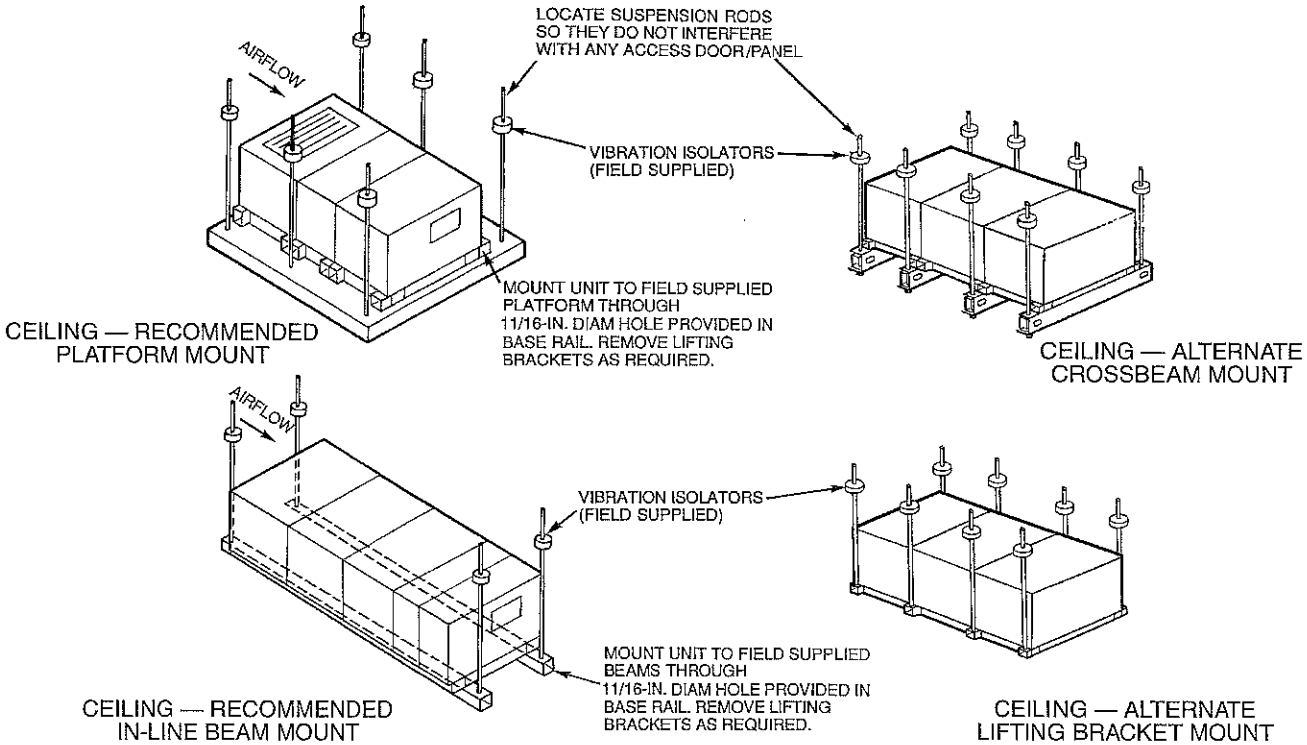


Fig. 5 — Unit Suspension

When field-supplied motors and drives have been installed, adjust the isolator springs as shown in Fig. 8 and described as follows:

1. Loosen the locknut on adjusting stem.
2. Turn the adjusting stem until the specified clearance of $^{13}/_{16} \pm {}^{1}/_{8}$-in. is obtained. (Turn clockwise to decrease clearance or counterclockwise to increase clearance.)
3. Tighten the locknut.
4. Repeat for each of the isolator springs and ensure that the fan sled is floating on the springs.

External Vibration Isolation — Install external vibration isolators per certified drawings, job specifications, and the instructions of the isolator manufacturer.

For applications that do not require internal fan isolation, leave the holddown bracket screwed or bolted in place. Otherwise, the combination of internal and external unit isolation could lead to unwanted oscillation magnification.

The coil piping must also be isolated or have flexible connectors to avoid coil header damage due to motion or vibration. Flexible connections should also be installed at the fan inlet (if ducted) and at the discharge.

Roof Curb — Roof curbs can be factory or field supplied for 39MW units and should be installed according to the manufacturer's instructions.

Before installing roof curb, check overall unit length. Figure 9 shows AHU (air-handling unit) curb pocket dimensions.

Curbs are typically shipped knocked down and require field assembly as follows:

1. Curbs greater than 12 ft in airway length will be split and joined together by a splice plate. Butt the two sections and bolt together with the splice plate as shown in Fig. 10.
2. Arrange sides and ends together at right angles and bolt together using the corner bracket as shown in Fig. 11.
3. Fasten cross supports, when required, per the drawings with supplied screws as shown in Fig. 12.
4. The 14 in. tall curbs weigh 6 lb per linear foot, 24 in. curbs weigh 9 lb per linear foot.

IMPORTANT: Verify installed curb dimensions before attempting to rig the unit and install it on the curb.

Due to the pressure capabilities of the 39 Series air handlers, duct connections must be gasketed and screwed to the unit to prevent leakage. Refer to Duct Connections section on page 40. No provisions have been made to attach the ductwork to the curb. Dimensions for inlet and discharge locations are shown in drawings produced in *AHU*Builder® program.

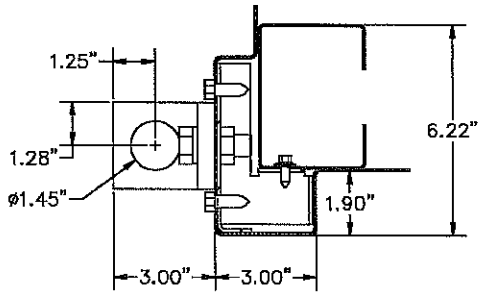


Fig. 9 — Curb Pocket Dimensions (Size 03-14 Typical)

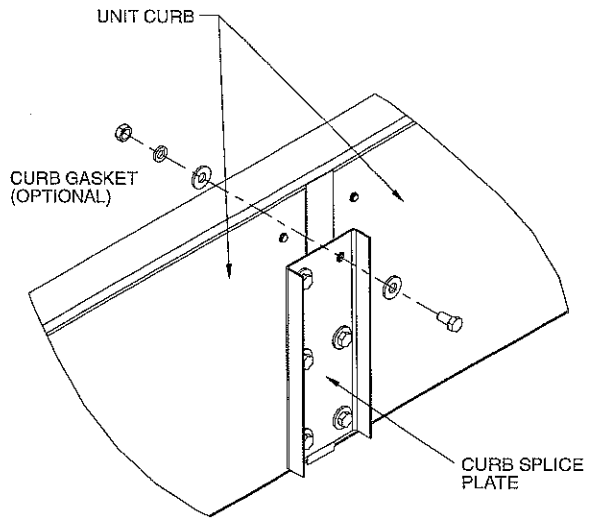


Fig. 10 — Splice Plate Usage

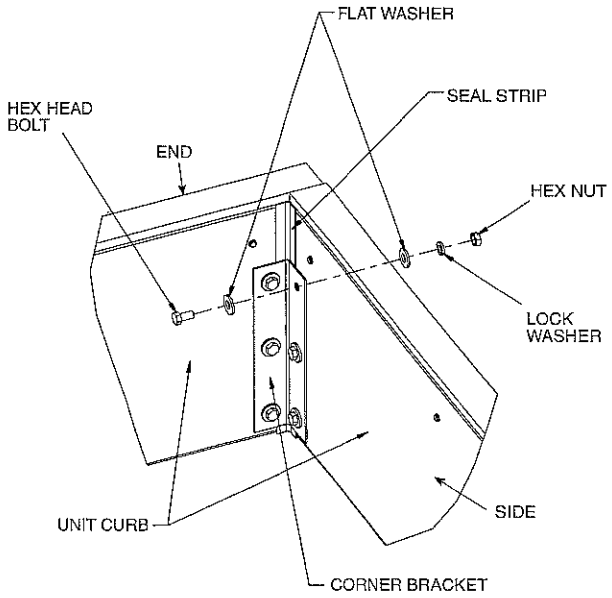


Fig. 11 — Corner Bracket

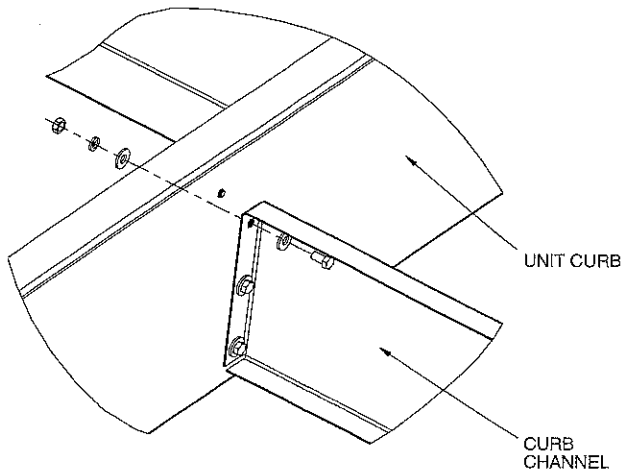


Fig. 12 — Fasten Cross Supports

INSTALLATION

This section describes how to install 39M units, components, and component parts. Units specified on a single order are shipped with most components assembled in the specified airflow direction. The assembled unit is attached to a single shipping skid (30-ft maximum length). When an upper component exceeds the 108-in. maximum height limit, it is shipped out of its operating position on the unit skid or on a separate skid. Some component parts also require assembly or adjustment; see the section on each component type for specific instructions.

Indoor Unit/Section Connection — Indoor units are connected together using 2 different methods — screws and "T" latch cam latches. Refer to Fig. 15 and 16 for T-latch assembly details. Connect units as follows:

1. Remove shipping plates from entering and leaving face of sections. Replace 2 screws in baserail directly under corner feet only, otherwise 2 inboard screws will not allow a flush connection. See Fig. 17.

   Level I and Level II thermal break units require $^1/_4$ in. thick x $1^1/_2$ in. wide grey foam gasket around the downstream frames of the mating sections.

   Level II thermal break units have an additional automotive style bulb seal installed by the factory which is integral to the thermal break.

   NOTE: Extra gasketing can be ordered in 50-ft rolls through the following:

   Carrier— 39TA-900---103

   Grainger— 6C524

   McMaster-Carr— 8694K94
2. Rig and align units so that sides and tops are flush and holes are aligned.
3. Fasten base rails together at the lifting brackets using supplied hardware.
4. Indoor units secured with "T" latches: Turn "T" latch (indicated by red hex socket access) clockwise using a $^5/_{16}$-in. hex wrench until latch fully engages. The latch rotates 270 degrees. The first 90 degrees of rotation positions the T-latch into a sealing position on the frame. The second 180-degree rotation pulls the T-latch tight, compressing the gasket which creates the frame seal.

⚠ CAUTION

Do not overtighten, damage to latch could occur. The latch is not intended to pull units together over a distance. Latch is designed for retention after units have been positioned properly and only after base rails have been secured.

NOTE: If T-latch becomes damaged or inoperable, fasten section frames using clearance and engagement holes located below latch.

5. Units secured with screws: Remove side and top panels from unit by removing panel screws. Fasten and secure frame rails.

NOTE: Upstream sections have a 1-in. clearance hole on the inner surface of the frame member to provide access to the $^5/_{16}$-in. fastening screw hole.

6. Insert screw through these holes to engage mating hole. Follow perimeter of unit and secure.
7. Reinstall panels and secure panel screws.

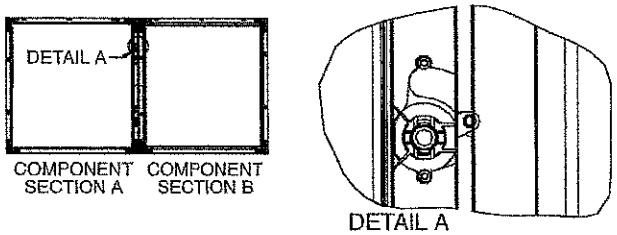


Fig. 15 — T-Latch Assembly

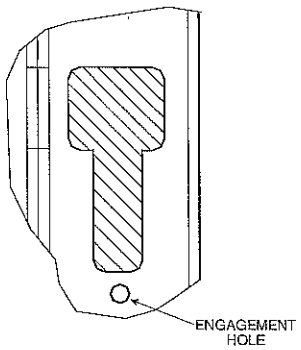


Fig. 16 — T-Latch Receptacle (End View)

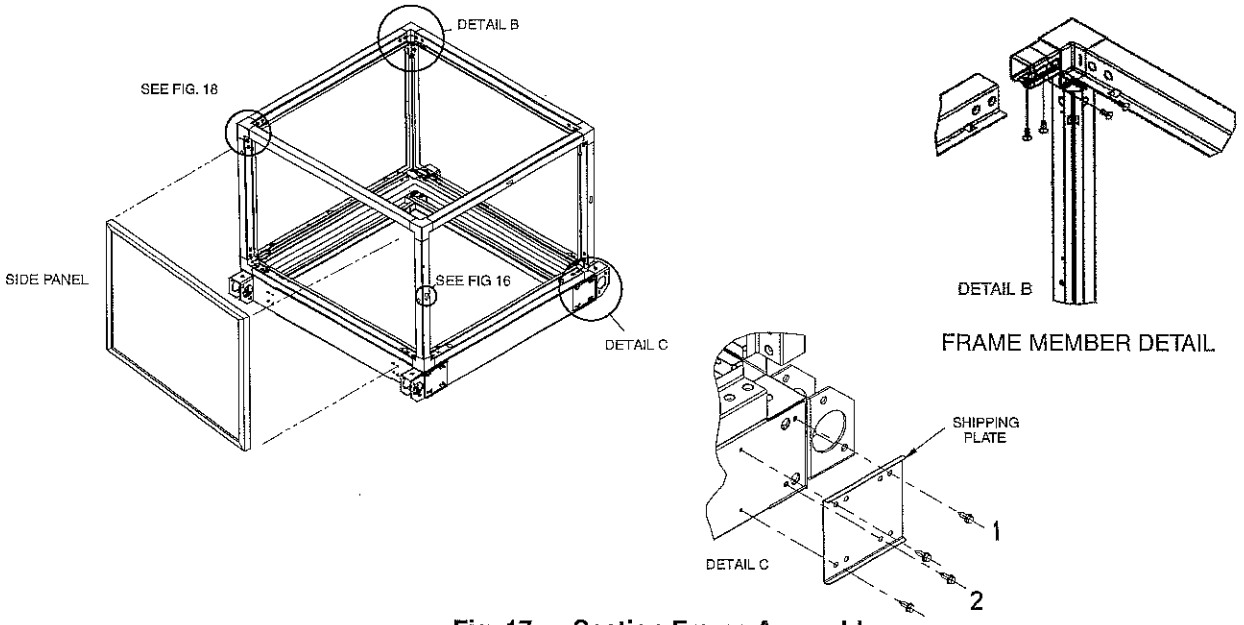


Fig. 17 — Section Frame Assembly

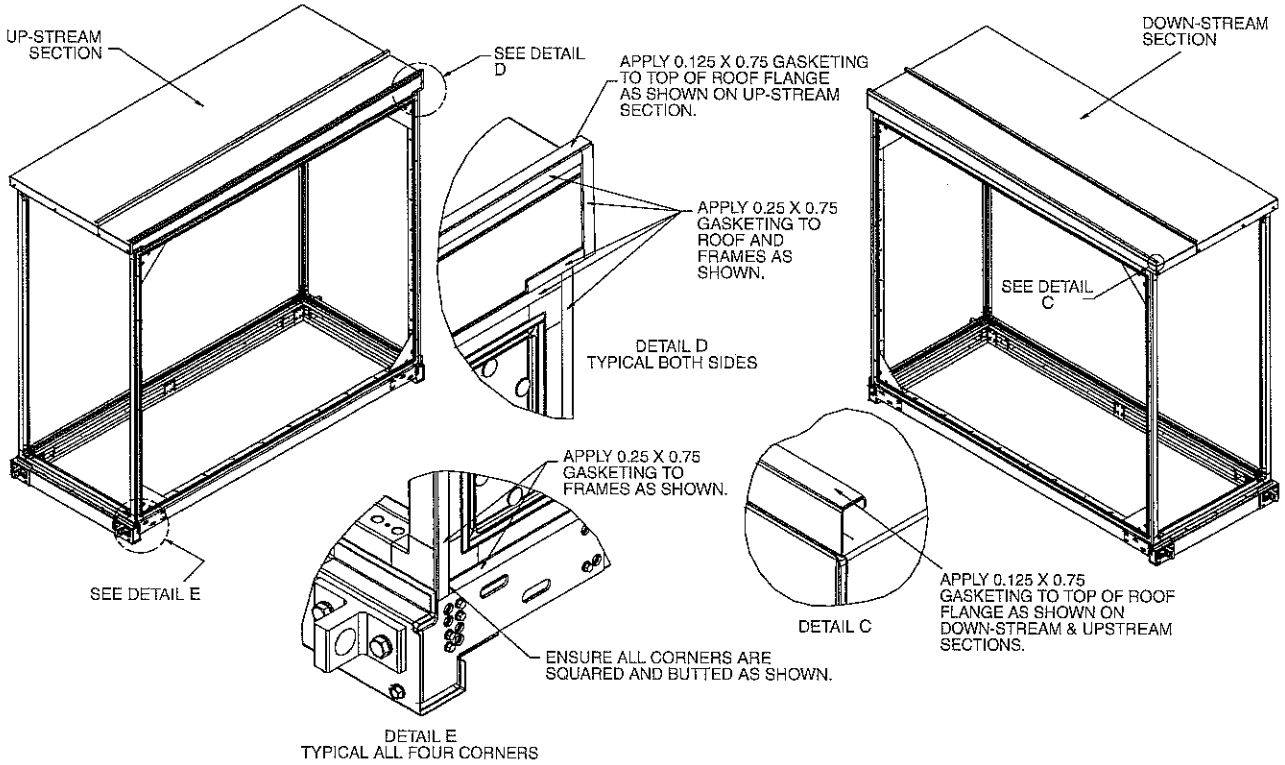


Fig. 19 — Assembly Gasket

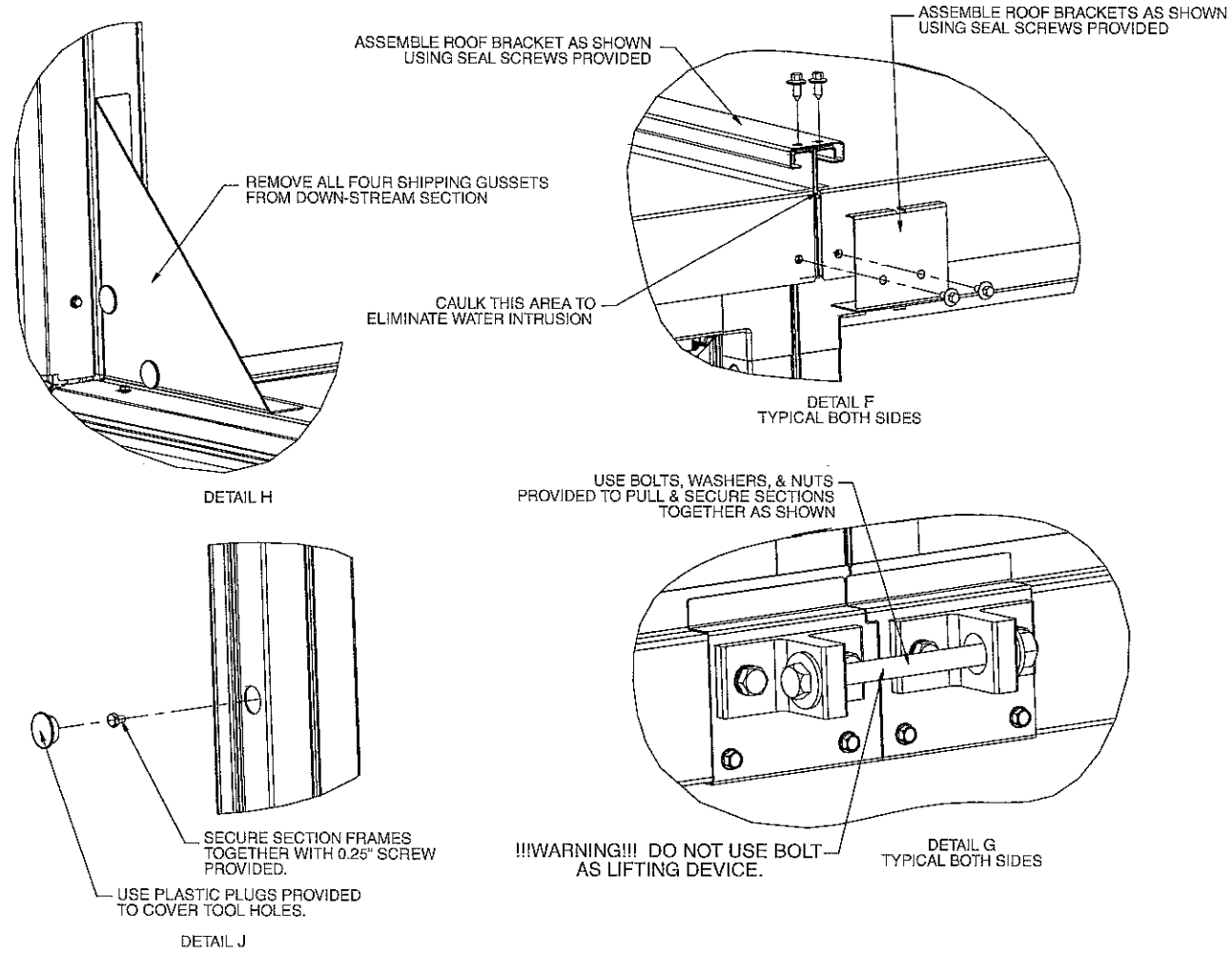


Fig. 20 — Securing Split Sections

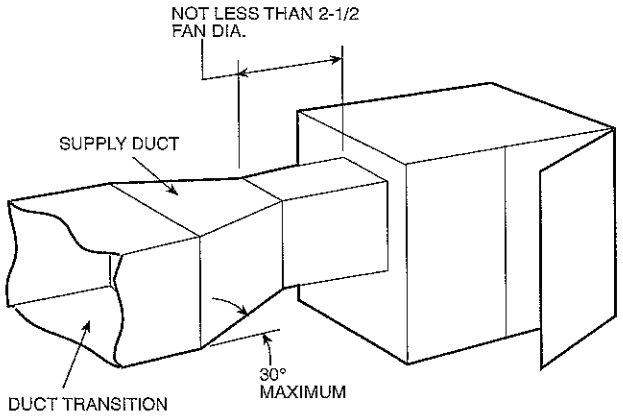


Fig. 23 — Duct Connections

BOTTOM RETURN FAN CONNECTIONS — Return air ducts must be attached directly to the return side of the unit. **This applies to both indoor and outdoor units!** Use care when making turns and transitions in ductwork to avoid excessive air friction. Duct elbows should contain turning vanes. See Fig. 22.

PLENUM FAN DUCT CONNECTIONS — Plenum fans are designed for draw-thru or blow-thru operation. Draw-thru fan sections have closed panels on all sides except for the fan inlet side. On blow-thru fan sections, the panel on the end opposite the inlet is omitted so that components such as coil or filter sections can be added downstream from the plenum fan.

DRAW-THRU PLENUM FAN DISCHARGE FABRICATION — Duct openings for draw-thru plenum fans must be field fabricated. They should be located in the plenum fan section according to the following guidelines:

- Locate discharge openings in side or top panels; the end panel opposite the inlet will have a higher pressure drop per the explanation in the 39M Product Data manual.
- Locate discharge openings on the side or top panels between the fan wheel and end panel opposite the inlet. Do not locate discharges in the direct path of airflow from the wheel.
- Avoid locating the discharge opening on the motor side of the fan section. If a discharge on the motor side is necessary, locate the opening near the top of the cabinet.
- Sizes 36-61 include intermediate frame members. When cutting the discharge opening for the plenum fan, do not cut through any intermediate frame member.

Typical duct locations are shown in Fig. 24.

Once the discharge locations are selected and cut, the duct connections can be fabricated. Install field-supplied duct flanges and framing channels to smooth the airflow leaving the discharge opening. Two of the channels should extend the width or height of the cabinet to provide additional cabinet support.

Panel Cutting — The 39M unit's double-wall foam-filled panels require special attention when cutting and or penetrating.

1. Take care in planning before penetrating any panel with electrical conduit, hydronic piping, sensor pickups or wiring. Once these are routed through a panel, for all practical purposes, it becomes a fixed panel that is not easily removed for service access.
2. In some cases it will be possible for smaller conduits ($^1/_2$-in. or $^3/_4$-in.) to enter the cabinet where individual sections are joined together. Inspect the selected area carefully to be certain that you do not encounter "T-latches" or section joining screws. Once the conduit is in place, it must be securely sealed, watertight and airtight, to prevent ANY infiltration.

   Penetrations are typically located in one of the existing "fixed" panels, such as the fan discharge panel, or the coil connection panel to maximize the number of removable/service panels. When it is necessary to penetrate the panel for wiring or piping entry, make certain that the entry point will not interfere with future component servicing, block access doors, or obstruct airflow.
3. Drill a small pilot hole completely through the panel.
4. Use of a sharp hole saw or, if appropriate, a Unishear™ cutting tool or sheet metal nibbler to cut the hole or opening from each side.

⚠ CAUTION

Do not use a cutting torch or open flame on or near the fan. Damage to the panel may occur.

5. Carefully remove the foam. The hole should be lined or sleeved to confine the foam, and the penetration should be sealed, both inside and out, to eliminate all possibility of infiltration or leakage.

NOTE: Small quantities of locally available commercial canned foam may be used, if necessary, to complete minor repairs. Significant patching may justify ordering replacement panels instead.

Face and Bypass Dampers — All face and bypass damper sections are shipped fully assembled. Hat channels are necessary for damper support. DO NOT remove (see Fig. 25). Unit sizes 03-12 are built with a single damper assembly, sizes 14-61 have two damper assemblies linked via a jackshaft. Damper crankarms have 90 degrees of travel from fully open to fully closed positions and are adjustable to suit conditions. Refer to Fig. 26 and 27 for details.

Actuators must be mounted directly to the damper shaft. Removal of crankarms is necessary for direct connection actuator use. Refer to Table 18 for operating torque requirements.

Table 18 — Damper Operating Torque (lb)

COMPONENT	39M UNIT SIZE													
	03	06	08	10	12	14	17	21	25	30	36	40	50	61
Zone Damper	—	4	4	4	5	5	5	5	5	5	7	7	8	10
Mixing or Exhaust Box	13	26	32	41	41	53	58	70	77	94	143	158	187	235
Side Mixing or Exhaust Box	12	25	28	37	46	56	61	76	91	105	146	160	207	248
Airflow Measuring Damper	5	9	9	9	16	16	16	29	29	29	N/A	N/A	N/A	N/A
Integral and Internal Face and Bypass	21	32	45	57	78	85	103	129	142	174	195	232	251	304
External Face and Bypass	29	44	59	76	96	104	126	161	176	217	282	312	390	470

NOTES:
1. Damper shaft moves 90 degrees from open to close.
2. Operating torques is shown for one damper. Multiply the value shown by the number of dampers for total with one actuator.

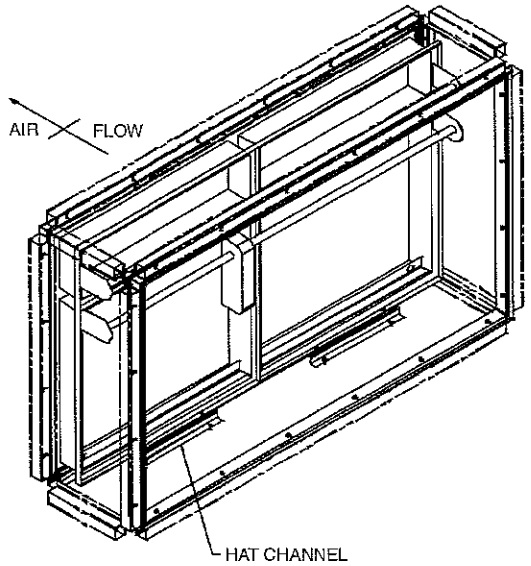
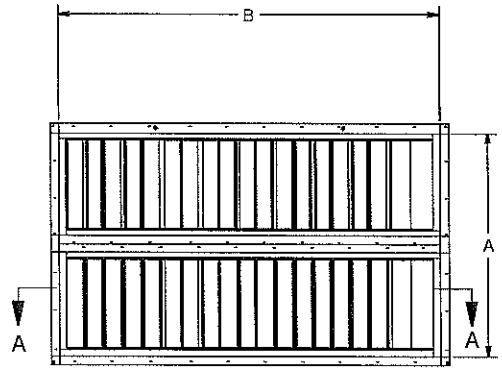


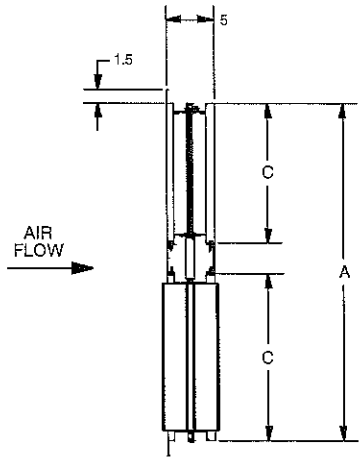
Fig. 25 — Face and Bypass Section Detail

ZONE DAMPER DETAILS

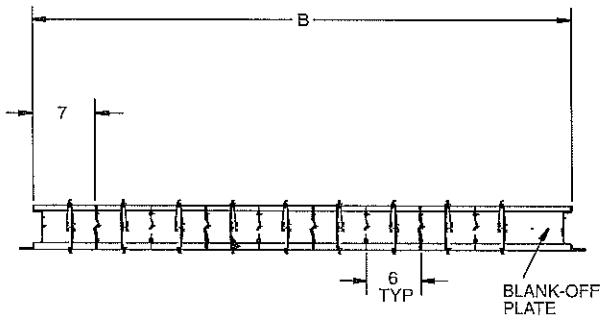
39M UNIT SIZE	DIMENSIONS (in.)			QTY OF ZONES	QTY OF EXTENSION SHAFT KITS
	A	B	C		
06	28.50	41.50	12	6	4
08	28.50	49.50	12	7	4
10	28.50	62.50	12	10	6
12	34.50	62.50	15	10	6
14	34.50	67.50	15	10	6
17	34.50	74.50	15	12	7
21	40.50	74.50	18	12	7
25	40.50	81.50	18	13	8
30	40.50	99.50	18	16	10
36	52.50	104.50	24	17	10
40	52.50	104.50	24	17	10
50	56.50	112.50	26	18	12
61	68.50	112.50	32	18	12



FACE VIEW



END VIEW



SECTION A-A

TOP VIEW

NOTE: All dimensions in inches unless otherwise noted.

Fig. 26 — Zone Damper Section Details

Zone Damper Section — Refer to Fig. 28 and install the section as follows:

1. Remove the screws holding the zone damper section to the heating coil section and remove the lag screws holding the damper to the shipping skid.
2. Place the supplied $^1/_4$-in. thick x $1^1/_2$-in. grey foam gasket around the perimeter of the cooling and heating coil section discharges. Use two gasket strips on partition panels to obtain double width.
3. Rig the zone damper section and lift it into position on (vertical discharge) or next to (horizontal discharge) the gasketed cooling and heating coil sections.
4. Fasten the damper section to the coil sections using the supplied $^1/_4$-14 x $^3/_4$-in. sheet metal screws.
5. Install control shaft and bearing for each individual zone after cutting linkage (for the job specific zone application).

   Control shaft extensions are bagged and wrapped to the inside of the zone damper blades. Additional field-supplied shaft extensions may be ordered from local Ruskin supplier, part no. 10-020569-00B.
6. Zones should be split for equal airflow through each damper.

⚠ CAUTION

Factory duct collars and damper assemblies are for attaching ductwork only and must NOT be used to support the duct's weight. Weight bearing deflection can increase torque necessary to operated dampers, or bind them preventing any movement.

ZONE DAMPER LINKAGE (Fig. 26 and 28) — Note that damper control levers and a common operating bar are factory installed on upper end of damper shafts on top of zoning damper assembly. To facilitate the installation of field-supplied damper operators, the operating bar may be cut and the control levers repositioned as follows:

⚠ CAUTION

Damper operation may be impaired if ductwork is supported by the unit.

1. Check job prints to determine number and size of zones required and damper operator locations.
2. Cut and remove portion of operating bar between zones as required.
3. Install actuators on field-fabricated support brackets. Connect actuator linkage to the center axle of interconnecting zones.
4. Adjust actuator for correct damper operation. Be sure actuator, linkage, and dampers operate freely. See Table 18 for operating torque requirements.

Mixing Box/Filter Mixing Box Damper Linkage

⚠ CAUTION

It is important to properly link the outdoor air and return air dampers. Failure to do so may cause mixing problems, stratification, or coil freezing under some conditions, especially in combination type filter mixing boxes.

Refer to Fig. 29 for typical damper arrangement and connecting rod position.

CONTROL DAMPERS — Control dampers may be operated with pneumatic or electric actuators. These items should be set up in accordance with the control manufacturers installation instructions.

DAMPER LINKAGE ADJUSTMENT — After the air-handling unit has been powered, the dampers should be checked to ensure they move freely and close tightly, adjustment of the linkage may be required.

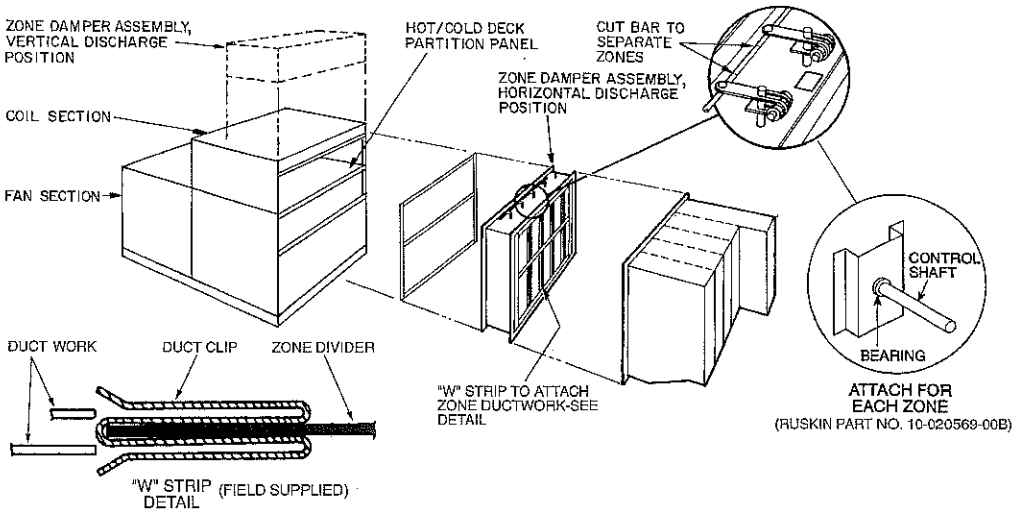


Fig. 28 — Zone Damper Assembly Details (Horizontal Discharge Shown)

FIELD SUPPLIED AND INSTALLED ACTUATORS — If one or two actuators are used, they must be mounted to the outdoor-air damper jackshaft. To properly set the connecting linkages, determine the rotation required to open the outdoor-air damper. Ensure the actuator spring return fully closes the outdoor-air damper.

If more than 2 actuators are used, they must be installed in equal numbers on each jackshaft. To properly set these dampers, determine the rotation required for each damper and mount the actuators so that the spring feature will open the return air damper and close the outdoor-air damper. Lock each damper actuator to the jackshaft. Remove any factory-supplied connecting linkage between the outdoor air and return-air dampers. Failure to do so will damage the actuators. No additional linkages are required for these applications.

Exhaust damper boxes are shipped with dampers in the closed position.

All damper crankarms have 90 degrees travel from open to closed. They may be adjusted to suit actuator location.

DO NOT mount damper actuators on the unit panels, actuators are shaft mount only. See Table 18 on page 41 for operating torque requirements.

Mixing Box Damper Actuators — The 39M mixing boxes can be supplied with direct mounted damper actuators. Refer to Fig. 30 for typical actuator mounting. Actuators are also available for field installation. See Field Supplied and Installed Actuators section for more information. Refer to Table 18 on page 41 for damper operating torque.

To ensure torque is transmitted equally to both damper sections, actuator must be connected to the jackshaft that drives the interconnecting linkage bar. Connection to any other shaft is not recommended.

Vertical Draw-Thru Units

NOTE: Size 21-61 vertical units that exceed the 108-in. maximum height or units with a vertical fan shipping split are shipped with the fan out of its operating position, separate from the vertical coil section. See Fig. 31A and 31B.

The unit is secured to a wooden skid with lag screws. Remove screws before lifting the unit.

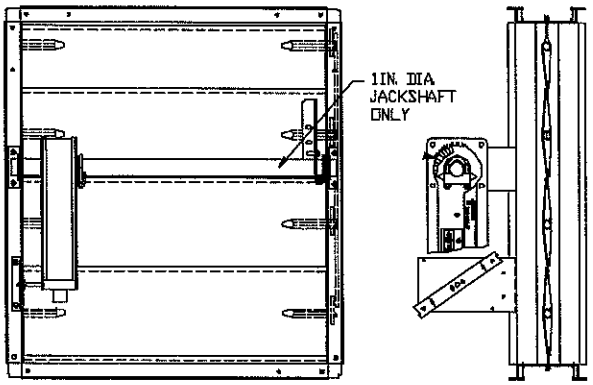


Fig. 30 — Typical Mixing Box Actuator Mounting

STACKED SUPPLY FAN SECTIONS

NOTE: Do not remove the spring isolator fan holddown bolts until the section is installed on the coil section.

1. For units with baserail, remove the 4 brackets securing the top panel of the cooling section and reposition them to the existing holes with the long flange in a vertical position flush with the outer panel.
2. Attach the $^1/_8$-in. thick by $^3/_4$-in. wide gray gasket supplied with the unit to the top perimeter opening of the vertical coil section.
3. For units with baserail, attach joining collar (supplied with unit) to top discharge opening using hardware included with unit. The joining collar is shipped broken down as four individual pieces. Each piece is constructed similar to the unit panels.
4. Rig the fan section using the lifting brackets and place it on top of the coil section.

NOTE: For units with baserail, the 4 brackets that were repositioned earlier should be aligned with the appropriate slots in the base rail of the fan section. Before setting the fan section on the coil section, remove right and left side panels from coil section.

5. For units without baserail, locate 1-in. tool clearance hole in underside of top rail of coil section on each side.
6. Insert a pin or punch to assist alignment of corresponding holes of fan section while lowering fan section, if needed.
7. Secure the fan and coil sections together using the supplied $^1/_4$ x $^3/_4$-in. long sheet metal screws. The securing points will be on the bottom of each side and front top rail of the coil section for units without baserail (Fig. 31B). For units with baserail, securing points are located in the side of the baserail (Fig. 31A).

NOTE: Do not remove the front panel of the coil section until the side panels are reinstalled. Secure brackets from top of coil section to fan section base rail using 2 screws each.

STACKED RETURN FAN AND EXHAUST BOX SECTIONS

NOTE: Do not remove the fan spring isolator holddown bolts until the section is installed.

1. For units with baserail, remove the brackets securing the top panel of the bottom section(s) and reposition them to the existing holes with the long flange in a vertical position flush with the outer panel.
2. Attach the $^3/_4$-in. thick by $1^1/_4$-in. wide gray gasket supplied with the unit to the top perimeter opening of the mixing box. (See Fig. 32).
3. Rig the top section(s) using the lifting brackets and place it on top of the bottom section(s).

   NOTE: For units with baserail, the brackets that were repositioned earlier should be aligned with the appropriate slots in the base rail of the top section(s). Before setting the top section on the bottom section(s), remove right and left side panels from bottom section.

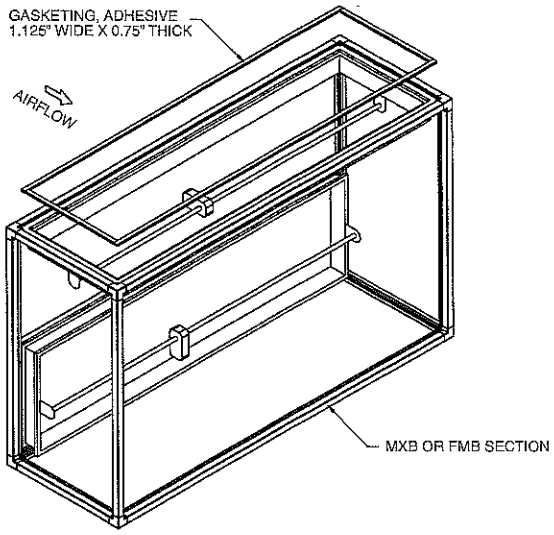


Fig. 32 — Attaching Gasket to Mixing Box

4. For units without baserail, locate 1-in. tool clearance hole in underside of top rail of coil section on each side.
5. Insert a pin or punch to assist alignment of corresponding holes of fan section while lowering fan section, if needed.
6. Secure the top and bottom sections together using the supplied $^1/_4$ x $^3/_4$-in. long sheet metal screws. The securing points will be on the bottom of each side and front top rail of the coil section for units without baserail (Fig. 31B). For units with baserail, securing points are located in the side of the baserail (Fig. 31A).

Fan Sled Disassembly — In some cases, it may be necessary to remove the fan sled from the unit and break it down into smaller components. See Tables 19-21 and Fig. 33 for maximum complete fan sled dimensions and housing only dimensions.

To remove the fan sled:

1. Remove all of the panels from the fan section except for the fan discharge panel.
2. Disconnect the vibration absorbent discharge seal by unscrewing the seal channels from the discharge of the fan housing. Remove the fan discharge panel.
3. On larger units, the fan sled may be extremely heavy. Remove the top and vertical frame members of the fan section by removing the 4 screws from each frame to corner piece connection.
4. If complete fan sled removal is required, unscrew bolts holding the isolator base to the bottom of the unit.
5. Disassemble fan and fan housing in place and/or affix appropriate rigging to remove the required components noting diagrammatically where each component is attached. Components should be removed in the following order:
   a. Belts and sheaves
   b. Motor
   c. Fan shaft
   d. Fan wheel (forward curved fan wheels are removed through the fan discharge opening, airfoil wheels are removed through the side of the housing after removal of the drive side inlet volute)
   e. Fan housing

NOTE: Install the preceding components in the reverse order.

Fan Sled Dimensions — See Tables 19-21 and Fig. 33 for fan sled dimensions.

Table 19 — Airfoil Fan Dimensions (in.)

UNIT SIZE 39M	ARRANGEMENT	FAN SLED ASSEMBLY (See Fig. 33)			FRAMED BLOWER WITHOUT SLED		
		Length	Width	Height	Length	Width	Height
03	All	35.5	23.5	28.8	18.6	21.0	21.9
06	All	36.5	33.5	28.7	22.4	24.0	26.8
08	All	29.8	45.5	31.8	24.6	26.3	29.3
10	All	29.8	58.5	31.8	24.6	26.3	29.3
12	All	35.8	58.5	38.8	29.6	30.3	36.0
14	All	41.8	63.5	38.8	29.6	30.3	36.0
17	All	41.8	70.5	41.8	32.5	33.8	39.6
21	All	41.7	72.0	51.8	35.9	36.5	43.6
25	All	53.8	77.5	51.8	39.5	39.8	48.1
30	All	53.8	95.5	51.8	39.5	39.8	48.1
36	Supply Std	56.3	100.5	62.8	43.8	43.3	52.8
	Ret/Exh Std	56.3	100.5	62.8	47.8	48.5	58.1
40	Supply Std	62.3	100.5	68.8	47.8	48.5	58.1
	Ret/Exh Std	62.3	100.5	68.8	52.9	53.0	64.9
50	Supply Std	68.3	108.5	78.8	52.9	53.0	64.9
	Ret/Exh Std	68.3	108.5	78.8	57.9	57.5	71.0
61	Supply Std	74.3	108.5	93.8	57.9	57.5	71.0
	Ret/Exh Std	74.3	108.5	93.8	65.9	62.8	78.8

NOTE: Different fan discharge positions have different dimensions. The values shown are for the largest overall dimensions.

Table 20 — Forward Curve Fan Dimensions (in.)

UNIT SIZE 39M	ARRANGEMENT	FAN SLED ASSEMBLY (See Fig. 33)			FRAMED BLOWER WITHOUT SLED		
		Length	Width	Height	Length	Width	Height
03	All - Horizontal	17.5	26.0	20.2	16.7	15.1	16.7
	All - Vertical	34.0	25.0	20.2	16.7	15.1	16.7
06	All - Horizontal	23.5	39.0	22.6	18.6	18.8	18.6
	All - Vertical	34.0	25.0	22.1	18.6	18.8	18.6
08	Sup/Ret Std	28.5	47.0	25.1	21.6	23.9	21.6
	Supply Small	28.5	47.0	20.6	18.6	18.8	18.6
10	Sup/Ret Std	28.5	60.0	29.0	25.5	27.9	25.5
	Supply Small	28.5	60.0	23.6	21.6	23.9	21.6
12	Sup/Ret Std	34.5	60.0	30.2	25.5	27.9	25.5
	Supply Small	34.5	60.0	25.8	21.6	22.9	21.6
14	Sup/Ret Std	40.5	65.0	35.1	30.4	32.5	30.4
	Supply Small	40.5	65.0	30.2	25.5	27.9	25.5
17	Sup/Ret Std	40.5	72.0	35.1	30.4	32.5	30.4
	Supply Small	40.5	72.0	30.2	25.5	27.9	25.5
21	Sup/Ret Std	40.5	72.0	42.7	38.0	33.3	38.0
	Supply Small	40.5	72.0	30.2	25.5	27.9	25.5
25	Sup/Ret Std	52.5	79.0	43.2	38.0	33.3	38.0
	Supply Small	52.5	79.0	43.2	38.0	30.3	38.0
30	Sup/Ret Std	52.5	97.0	43.2	38.0	37.3	38.0
	Supply Small	52.5	97.0	43.2	38.0	35.3	38.0
36	Sup/Ret Std	53.8	100.5	62.8	46.8	43.5	46.8
	Supply Small	53.8	100.5	62.8	41.5	39.8	41.5
40	Sup/Ret Std	53.8	100.5	68.8	46.8	43.5	46.8
	Supply Small	53.8	100.5	68.8	46.8	38.5	46.8
50	Sup/Ret Std	58.3	108.5	78.8	51.5	52.3	51.5
	Supply Small	58.3	108.5	78.8	51.5	46.8	51.5
61	Sup/Ret Std	56.8	108.5	93.8	55.5	54.3	55.5
	Supply Small	56.8	108.5	93.8	51.5	52.3	51.5

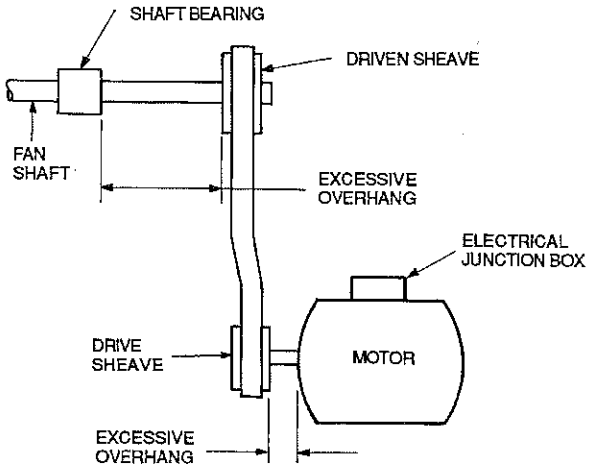


Fig. 35 — Determining Sheave-Shaft Overhang

ALIGNMENT — Make sure that fan shafts and motor shafts are parallel and level. The most common causes of misalignment are nonparallel shafts and improperly located sheaves. Where shafts are not parallel, belts on one side are drawn tighter and pull more than their share of the load. As a result, these belts wear out faster, requiring the entire set to be replaced before it has given maximum service. If misalignment is in the sheave, belts enter and leave the grooves at an angle, causing excessive belt and sheave wear.

1. Shaft alignment can be checked by measuring the distance between the shafts at 3 or more locations. If the distances are equal, then the shafts are parallel.
2. Sheave Alignment:

   Fixed sheaves — To check the location of the fixed sheaves on the shafts, a straightedge or a piece of string can be used. If the sheaves are properly aligned, the string will touch them at the points indicated by the arrows in Fig. 36.

   Adjustable sheaves — To check the location of adjustable sheave on shaft, make sure that the centerlines of both sheaves are in line and parallel with the bearing support channel. See Fig. 36. Adjustable pitch drives are installed on the motor shaft. Carrier recommends that adjustable sheaves should only be used for initial balancing and be replaced with fixed pitch sheaves by the air balancer prior to the final system air balance.

⚠ CAUTION

Do not exceed maximum fan speed rpm with adjustable sheave.

3. Rotate each sheave one-half revolution to determine whether the sheave is wobbly or the drive shaft is bent. Correct any misalignment.
4. With sheaves aligned, tighten cap screws evenly and progressively.

NOTE: There should be a $^1/_8$-in. to $^1/_4$-in. gap between the mating part hub and the bushing flange. If gap is closed, the bushing is probably the wrong size.

5. With taper-lock bushed hubs, be sure the bushing bolts are tightened evenly to prevent side-to-side pulley wobble. Check by rotating sheaves and rechecking sheave alignment. When substituting field-supplied sheaves for factory-supplied sheaves, consider that fan shaft sheave has been factory balanced with fan and shaft as an assembly. For this reason, substitution of motor sheave is preferable for final speed adjustment.

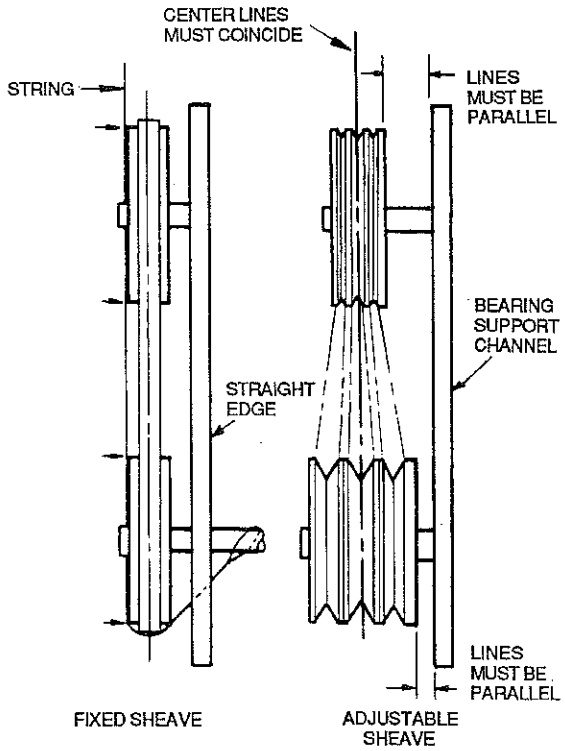
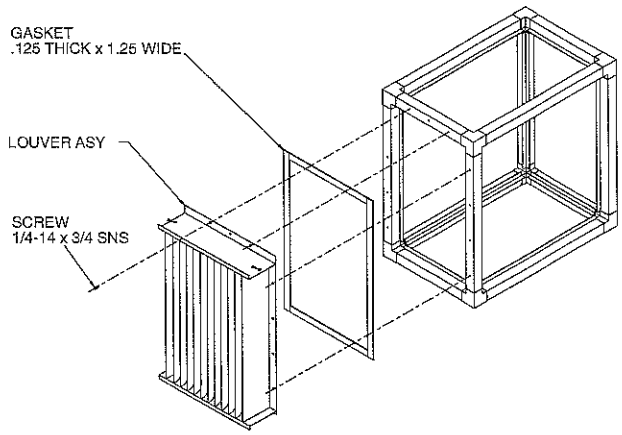


Fig. 36 — Determining Sheave-Shaft Alignment



NOTE: All dimensions in inches unless otherwise noted.

Fig. 39 — Louver Intake

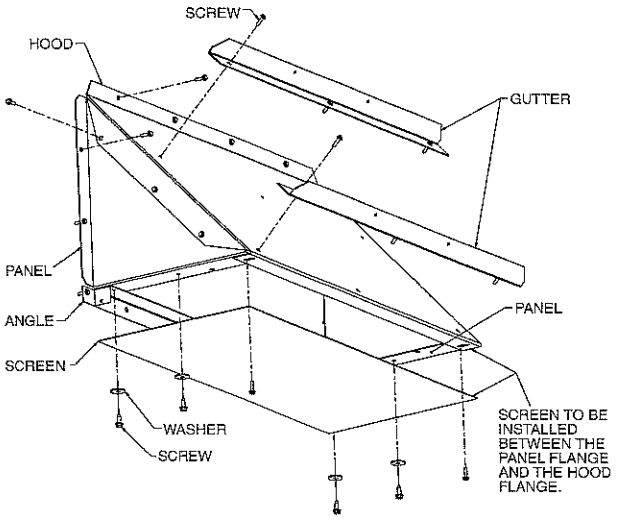


Fig. 41 — Collapsible Exhaust Box Hood (Assembly)

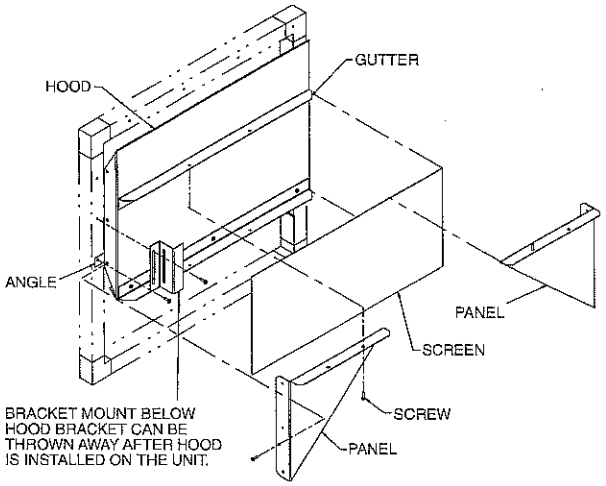


Fig. 40 — Collapsible Exhaust Box Hood (Shipping Position)

6. Screw side flashings using predrilled holes in main unit frame rails as shown in Fig. 46.

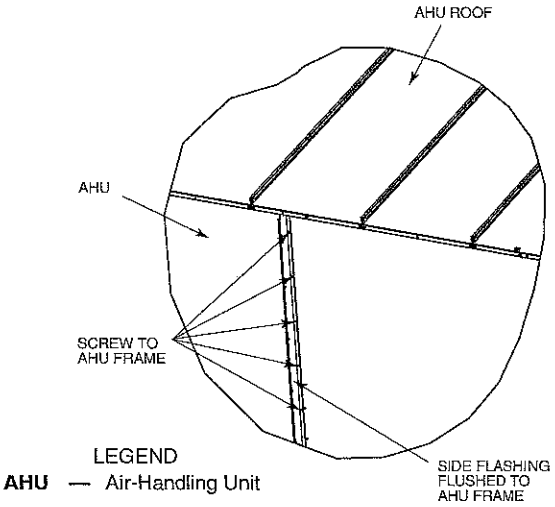
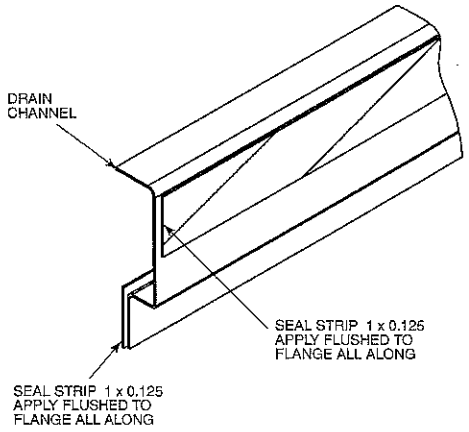


Fig. 46 — Screwing Side Flashings to Unit

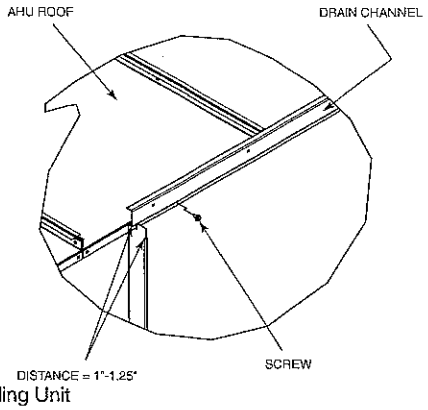
7. Apply seal strips (1 in. x .125 in. wide) to roof drain channel as shown in Fig. 47.



NOTE: Measurements are shown in inches.

Fig. 47 — Applying Seal Strip to Roof Drain Channel

8. Remove screws from the edge of the roof where the CCH will span.
9. Position drain channel along the roof edge and mark the hole locations as shown in Fig. 48.



NOTE: Measurements are shown in inches.

Fig. 48 — Marking Hole Locations along Roof Edge

10. Remove drain channel from unit and drill marked locations with a ¼ in. drill bit.
11. Attach drain channel to roof of main unit using screws originally removed in Step 8.
12. Position the CCH as shown in Fig. 49.

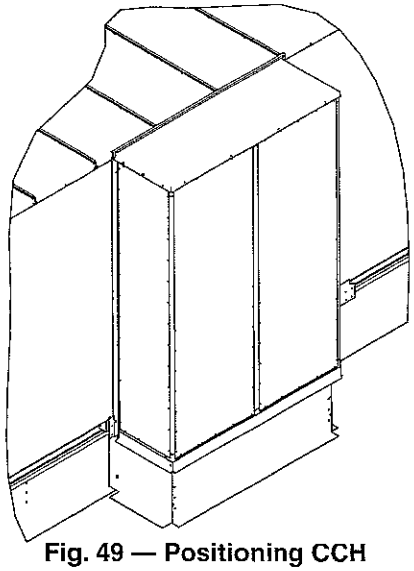


Fig. 49 — Positioning CCH

13. The drain channel and roof cap should be flush as shown in Fig. 50. Seal any small gaps as shown.

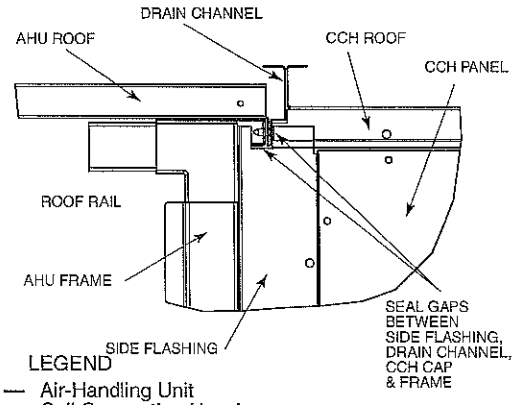


Fig. 50 — Sealing Gaps

CAREL PART NUMBER	DESCRIPTION	COMPONENTS
599-02000CKIT	1/2-in. valve size Cv= 0.4	(2) 1/2-in. or 3/4-in. MPT x 3-in. nipples (2) 1/2-in. or 3/4-in. FPT x 1-in. MPT hex bushings 1-in. union
599-02002CKIT	1/2-in. valve size Cv= 0.63	
599-02004CKIT	1/2-in. valve sizes Cv= 1	
599-02006CKIT	1/2-in. valve sizes Cv= 1.6	
599-02008CKIT	1/2-in. valve sizes Cv= 2.5	
599-02010CKIT	1/2-in. valve sizes Cv= 4	
599-02012CKIT	3/4-in. valve size Cv= 6.3	

Cv — Flow Coefficient

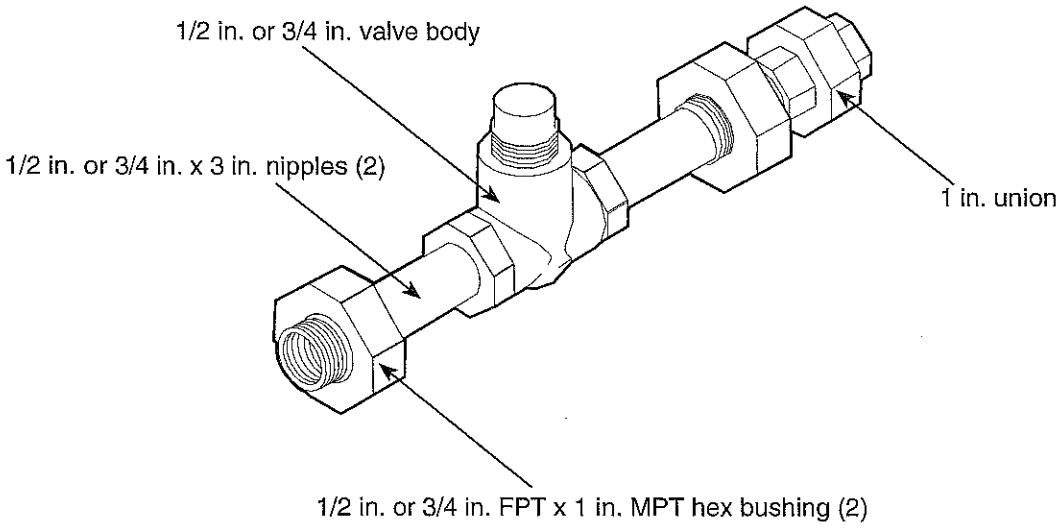


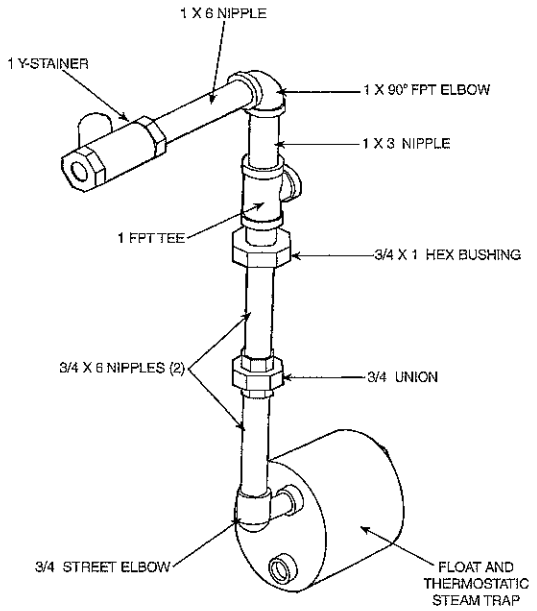
Fig. 54 — 1/2-in. and 3/4-in. Valve Assemblies

ASSEMBLE STRAINER AND TRAP ASSEMBLY AND VALVE ASSEMBLY (Fig. 58 and 59) — Strainer and trap assemblies are sold as separate items through your local Carel representative (shipped unassembled). Figures 58 and 59 each show a detailed list of components in those kits.

Alternatively, strainers and traps from any manufacturer may be used with the Carel humidifier. In this case, the trap size is based on the condensate connection size leaving the humidifier. Figures 58 and 59 can then be used as a guide to purchase the remainder of the components locally.

1 in. Strainer and Trap Assembly

CAREL PART NUMBER	DESCRIPTION	COMPONENTS
USTT&SKIT1	1 in. Steam trap and strainer with plumbing kit	1 in. Y-strainer 1 in. x 6 nipple 1 in. x 90 degree FPT elbow 1 in. x 3 in. nipple 1 in. FPT tee 3/4-in. x 1 in. hex bushing (2) 3/4-in. x 6 in. nipples 3/4-in. FPT union 3/4-in. 90 degree street elbow 3/4-in. float and thermostatic trap

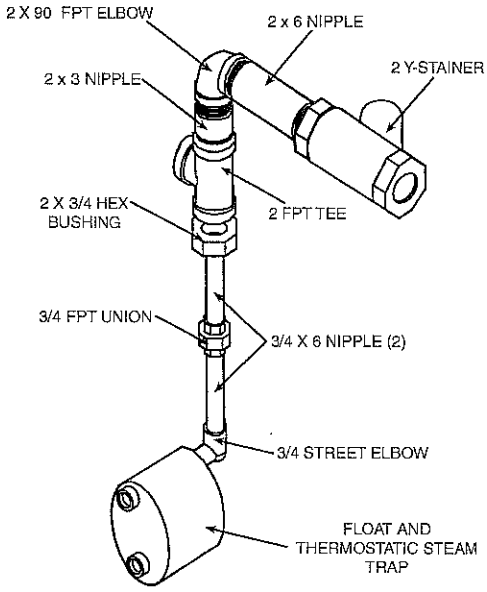


NOTE: All dimensions in inches.

Fig. 58 — 1 in. Steam Trap and Strainer with Plumbing Kit

2 in. Strainer and Trap Assembly

CAREL PART NUMBER	DESCRIPTION	COMPONENTS
USTT&SKIT2	2 in. Steam trap and strainer with plumbing kit	2 in. Y-strainer 2 in. x 6 nipple 2 in. x 90 degree FPT elbow 2 in. x 3 in. nipple 2 in. FPT tee 2 in. x 3/4-in.hex bushing (2) 3/4-in. x 6 in. nipples 3/4-in. FPT union 3/4-in. 90 degree street elbow 3/4-in. float and thermostatic trap



NOTE: All dimensions in inches.

Fig. 59 — 2 in. Steam Trap and Strainer with Plumbing Kit

CONNECT CONTROL VALVE AND TRAP TO STEAM SUPPLY AND MANIFOLD (Fig. 60 and 61).

Coil Installation

NOTE: If installing a replacement coil, refer to Coil Removal section, page 97 for instructions on removing existing coil.

INSTALLATION OF SINGLE HEIGHT COILS (sizes 03-36)

1. Lock open and tag all power supplies to unit fan motor and electric heaters if present.
2. Remove service panel/coil connection panel and the upstream service panel and set aside in a safe place.
3. a. Remove the flat corner plug from each end piece of the top rail.
   b. Extract the Torx T25 screw visible within the exposed cavity. (Do not mix these screws with others; they are specific for this location. Set screws aside for reinstallation of the top rail.)
   c. Remove the top rail by pulling out at a 45-degree angle. Set top rail aside.

⚠ CAUTION

Do not handle the coil by the headers or connection nipples, as irreparable damage might occur that is NOT covered by warranty. Protect the finned surface from damage during all handling and shipping.

4. Slip the foam sealing sleeves on the connection nipples before installing the coil.
5. The coil may now be hoisted in through the top opening, or it may be slid in through either side, taking care to avoid tipping or dropping the coil. Some lower stacked unit sections may require slightly tipping the coil from the vertical position in order to clear the upper frame rail and seal, which is not readily removed.
6. Loosely secure the coil at the top using the $^3/_8$-in. diameter hoisting holes located in the side channel/tube sheet juncture at each end.
7. Install the first coil in the section. Access the upstream face of the coil and install the screws holding the coil to the mounting baffles around the entire perimeter. This may require reaching through an opened damper assembly or through the filter track after filters are removed.
8. Replace the top rail by reinstalling the Torx T25 screws and flat corner plugs.
9. Replace all service panels.

INSTALLATION OF STACKED COILS (Sizes 40, 50 and 61)

IMPORTANT: The lengths of the coil supports and intermediate pans and channels are designed to work with Carrier coils. Substitution of other manufacturer's coils may require that custom mounting components be field fabricated. *Coil sections ordered without coils will come with the referenced parts in kit form.*

NOTE: The length that the intermediate drain pan extends downstream from the coil face has been designed for use with Carrier manufactured coils, and may prove insufficient for other maker's coils.

1. Lock open and tag all power supplies to unit fan motor and electric heaters if present.
2. Remove service panel/coil connection panel and the upstream service panel and set aside in a safe place.
3. a. Remove the flat corner plug from each end piece of the top rail.
   b. Extract the Torx T25 screw visible within the exposed cavity. (Do not mix these screws with others; they are specific for this location. Set screws aside for reinstallation of the top rail.)
   c. Remove the top rail by pulling out at a 45-degree angle. Set top rail aside.

⚠ CAUTION

Do not handle the coil by the headers or connection nipples, as irreparable damage might occur that is NOT covered by warranty. Protect the finned surface from damage during all handling and shipping.

4. Slip the foam sealing sleeves on the connection nipples before installing the coil.
5. Before placing the coils inside the unit, apply the adhesive backed gasket to the lower baffle, spanning the entire unit, on the surface that will contact the coil (see Fig. 63).
6. a. Place the lower coil on the coil supports, sliding the coil against the upstream baffle and aligning the mounting holes so that the connection nipple will extend approximately 3 in. outside the unit casing.
   b. Place the heavy vertical angle (which is full height of the finished coil bank) along the upstream right and left side of the mounting baffles (see Fig. 63). Install screws through this angle first and then into the baffles, engaging the coil tube sheet mounting holes and securing the coil within the unit.
   c. Secure the lower side casing of the coil to the lower horizontal baffle, sandwiching the gasket in between.
7. For coil sections that do not have a drain pan within the section, go to Step 10.
8. Secure the spacer (hat channel) to the top center of the lower coil casing (see Fig. 64).

⚠ CAUTION

Do not penetrate through the coil casing into the fin pack. Tube damage may occur.

9. Secure two spacers (hat channels) to each end of the bottom of the upper coil casing before placing the coil in position (refer to Fig. 63).
10. Place the intermediate condensate drain pan on the lower coil, centering the drain pan between the sides of the unit, with the condensate outlet holes along the downstream edge. (It may be helpful to temporarily secure the drain pan by a strip of double-stick tape on the center hat channel.)
11. Lift the upper coil (with spacer hat channels on the bottom of each end) into place, aligning the upper coil with the lower coil. When the upper coil is lowered into place, it will deflect the intermediate condensate pan downward on each end, providing for positive drainage.
12. Install factory-supplied screws around the ends and top of

Water and Steam Coil Piping Recommendations

GENERAL — Use straps around the coil casing or the lifting holes (see Fig. 66) to lift and place the coil.

⚠ CAUTION

To prevent damage to the coil or coil headers: Do not use the headers to lift the coil. Support the piping and coil connections independently. Do not use the coil connections to support piping. When tightening coil connections, use a backup wrench on the nozzles.

Piping practices are outlined in the Carrier System Design Manual, Part 3, Piping Design.

WATER COILS — Typically, coils are piped by connecting the supply at the bottom and the return at the top. See Fig. 66. This is not always the case, especially if the coil hand has been changed in the field. Coils must be piped for counterflow; otherwise, a capacity reduction of 5% for each coil row will result. To ensure counterflow, chilled water coils are piped so that the coldest water meets the coldest air. Hot water coils are piped so that the warmest water meets the warmest air.

STEAM COILS — Position the steam supply connection at the top of the coil, and the return (condensate) connection at the bottom. The coil tubes must incline downwards toward the return header connection for condensate drainage. See Fig. 67-71.

Figure 67 illustrates the normal piping components and the suggested locations for high, medium, or low-pressure steam coils. The low-pressure application (zero to 15 psig) can dispense with the $^1/_4$-in. petcock for continuous venting located above the vacuum breaker (check valve).

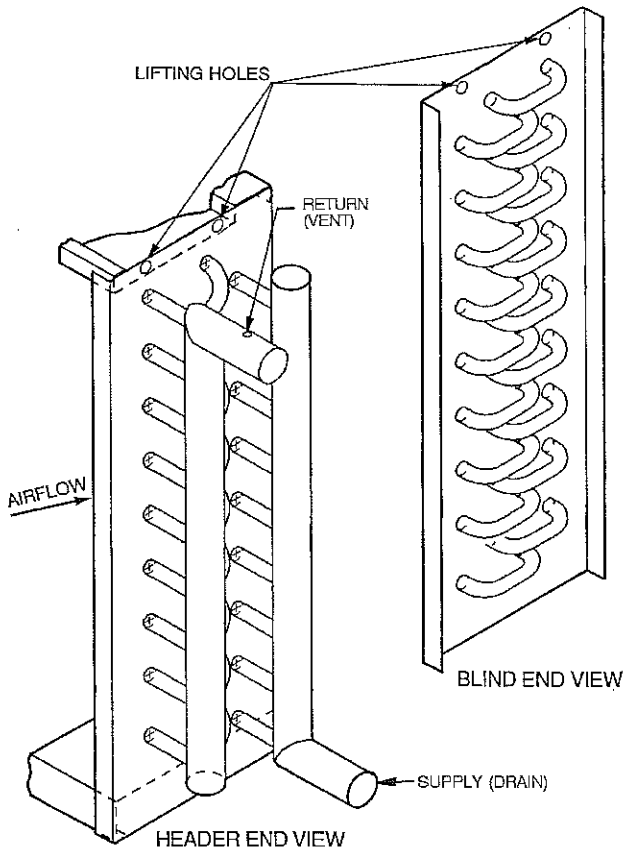


Fig. 66 — Coil Connections and Lifting Points

Note the horizontal location of the 15-degree check valve, and the orientation of the gate/pivot. This valve is intended to relieve any vacuum forming in the condensate outlet of a condensing steam coil, and to seal this port when steam pressure is again supplied to the coil. It must not be installed in any other position, and should not be used in the supply line.

For coils used in tempering service, or to preheat outside air, install an immersion thermostat in the condensate line ahead of the trap. This will shut down the supply fan and close the outdoor damper whenever the condensate falls to a predetermined point, perhaps 120 F.

NOTE: Do NOT use an immersion thermostat to override a duct thermostat and open the steam supply valve.

For vacuum return systems, the vacuum breaking check valve would be piped into the condensate line between the trap and the gate valve instead of open to the atmosphere.

Figure 68 illustrates the typical piping at the end of every steam supply main. Omitting this causes many field problems and failed coils.

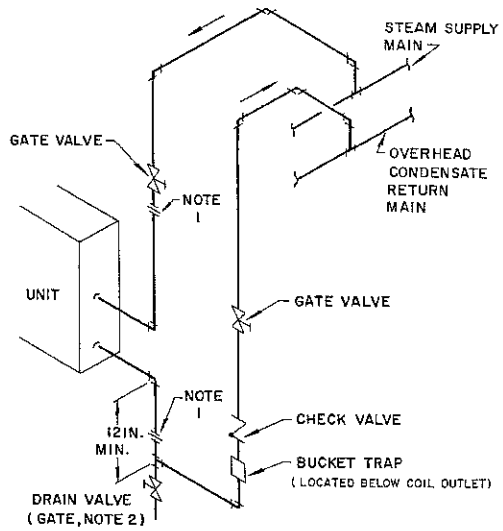
Figure 69 shows the typical field piping of multiple coils. Use this only if the coils are the same size and have the same pressure drop. If this is not the case, an individual trap must be provided for each coil.

Figure 70 shows a multiple coil arrangement applied to a gravity return, including the open air relief to the atmosphere, which DOES NOT replace the vacuum breakers.

Figure 71 illustrates the basic condensate lift piping.

Following the piping diagrams in Fig. 67-71, make all connections while observing the following precautions:

- Install a drip line and trap on the pressure side of the inlet control valve. Connect the drip line to the return line downstream of the return line trap.
- To prevent scale or foreign matter from entering the control valve and coil, install a $^3/_{32}$-in. mesh strainer in the steam supply line upstream from the control valve.
- Provide air vents for the coils to eliminate noncondensable gases.
- Select a control valve according to the steam load, not the coils supply connection size. Do not use an oversized control valve.
- Do not use bushings that reduce the size of the header return connection. The return connection should be the same size as the return line and reduced only at the downstream trap.
- To lift condensate above the coil return line into overhead steam mains, or pressurized mains, install a pump and receiver between the condensate trap and the pressurized main. Do not try to lift condensate with modulating or on-and-off steam control valves. Use only 15-degree check valves, as they open with a lower water head. Do not use 45-degree or vertical-lift check valves.
- Use float and thermostatic traps. Select the trap size according to the pressure difference between the steam supply main and the return main.
- Load variations can be caused by uneven inlet air distribution or temperature stratification.
- Drain condensate out of coils completely at the end of the heating season to prevent the formation of acid.



NOTES:
1. Flange or union is located to facilitate coil removal.
2. To prevent water hammer, drain coil before admitting steam.
3. Do not exceed one foot of lift between trap discharge and return main for each pound of pressure differential.
4. *Do not use this arrangement for units handling outside air.*

Fig. 71 — Condensate Lift to Overhead Return

Coil Freeze-Up Protection

WATER COILS — If a chilled water coil is applied with outside air, provisions must be made to prevent coil freeze-up. Install a coil freeze-up thermostat to shut down the system if any air temperature below 36 F is encountered entering the water coil. Follow thermostat manufacturer's instructions.

When a water coil is applied downstream of a direct-expansion (DX) coil, a freeze-up thermostat must be installed between the DX and water coil and electrically interlocked to turn off the cooling to prevent freeze-up of the water coil.

For outdoor-air application where intermittent chilled water coil operation is possible, one of the following steps should be taken:

- Install an auxiliary blower heater in cabinet to maintain above-freezing temperature around coil while unit is shut down.
- Drain coils and fill with an ethylene glycol solution suitable for the expected cold weather operation. Shut down the system and drain coils. See Service section, Winter Shutdown, page 96.

STEAM COILS — When used for preheating outdoor air in pressure or vacuum systems, an immersion thermostat to control outdoor-air damper and fan motor is recommended. This control is actuated when steam supply fails or condensate temperature drops below an established level, such as 120 to 150 F. A vacuum breaker should also be used to equalize coil pressure with the atmosphere when steam supply throttles close. Steam should not be modulated when outdoor air is below 40 F.

On low-pressure and vacuum steam-heating systems, the thermostat may be replaced by a condensate drain with a thermal element. This element opens and drains the coil when condensate temperature drops below 165 F. Note that condensate drains are limited to 5 psig pressure.

INNER DISTRIBUTING TUBE STEAM COILS — The inner distributing tube (IDT) steam coil used in the Carrier 39M air-handling units has an inner tube pierced to facilitate the distribution of the steam along the tube's length. The outer tubes are expanded into plate fins. The completed assembly includes the supply and condensate header and side casings which are built to slant the fin/tube bundle back toward the condensate header. The slanting of the assembly ensures that condensate will flow toward the drains. This condensate must be removed through the return piping to prevent premature failure of the coil. The fin/tube bundle is slanted vertically for horizontal airflow coils, and horizontally for vertical airflow coils.

IDT Steam Coil Piping — The following piping guidelines will contribute to efficient coil operation and long coil life:

1. Use full size coil outlets and return piping to the steam trap. Do not bush return outlet to the coil. Run full size to the trap, reduce at the trap.
2. Use float and thermostatic (F & T) traps only for condensate removal. Trap size selection should be based on the difference in pressure between the steam supply main and the condensate return main. It is good practice to select a trap with 3 times the condensate rating of the coil to which it is connected.
3. Use thermostatic traps for venting only.
4. Use only $^1/_2$-in., 15-degree swing check valves installed horizontally, piped open to atmosphere, and located at least 12 in. above the condensate outlet. Do not use 45-degree, vertical lift and ring check valves.
5. The supply valve must be sized for the maximum anticipated steam load.
6. Do not drip steam mains into coil sections. Drip them on the pressure side of the control valve and trap them into the return main beyond the trap for the coil.
7. Do not use a single trap for two or more coils installed in series. Where two or more coils are installed in a single bank, in parallel, the use of a single trap is permissible, but only if the load on each coil is equal. Where loads in the same coil bank vary, best practice is to use a separate trap for each coil.

   Variation in load on different coils in the same bank may be caused by several factors. Two of the most common are uneven airflow distribution across the coil and stratification of inlet air across the coil.
8. Do not try to lift condensate above the coil return into an overhead main, or drain into a main under pressure with a modulating or on/off steam control valves. A pump and receiver should be installed between the coil condensate traps and overhead mains and return mains under pressure.
9. Use a strainer ($^3/_{32}$-in. mesh) on the steam supply side, as shown in the piping diagrams, to avoid collection of scale or other foreign matter in the inner tube distributing orifices.

NOTE: The IDT coils must be installed with the tubes draining toward the header end of the coil. Carrier's IDT steam coils are pitched toward the header end as installed in the unit.

10. Ensure the AHU is installed level to maintain the inherent slope. Also ensure the unit is installed high enough to allow the piping to be installed correctly, especially the traps which require long drip legs.
11. Do not fail to provide all coils with the proper air vents to eliminate noncondensable gasses.
12. Do not support steam piping from the coil units. Both mains and coil sections should be supported separately.

IDT Steam Coil Installation — Refer to drawings to position the coils properly with regard to the location of the supply and return connections. Ensure that the IDT coil is pitched with the tubes draining toward the header. Carrier's AHUs provide proper coil pitch when the AHU is installed level.

Refer to schematic piping diagrams and piping connection notes for the recommended piping methods.

Distributor Nozzle Change-Out — Distributor nozzles are factory supplied. Thermostatic expansion valves (TXVs) are field supplied. Be sure that correct nozzle is installed in each distributor before installing expansion valve. See Table 4 for factory-installed distributor nozzle sizes. Use *AHU*Builder® program to select nozzles for best performance; replacement nozzles must be field-installed. The correct nozzle is typically factory-installed.

⚠ CAUTION

Do not overheat distributor or cap. Overheating cap and distributor will harden solder and make cap impossible to remove.

Perform nozzle change-out procedure as follows:

1. Unsweat distributor cap and Schrader valve (see Fig. 74). Do not overheat distributor.
2. Clean off any remaining solder.
3. Remove nozzle retaining ring with screwdriver or needle nosed pliers.
4. Remove nozzle from distributor by inserting 2 no. 6-32 threaded rods (at least 4-in. long) into the threaded holes provided in the nozzle. See Fig. 75.
5. Insert correct nozzle into distributor body.
6. Re-insert nozzle retainer ring into distributor.

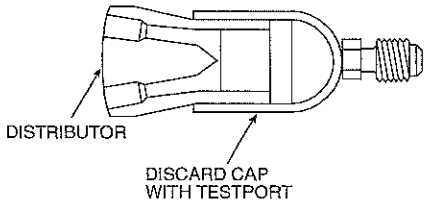


Fig. 74 — Distributor and Cap

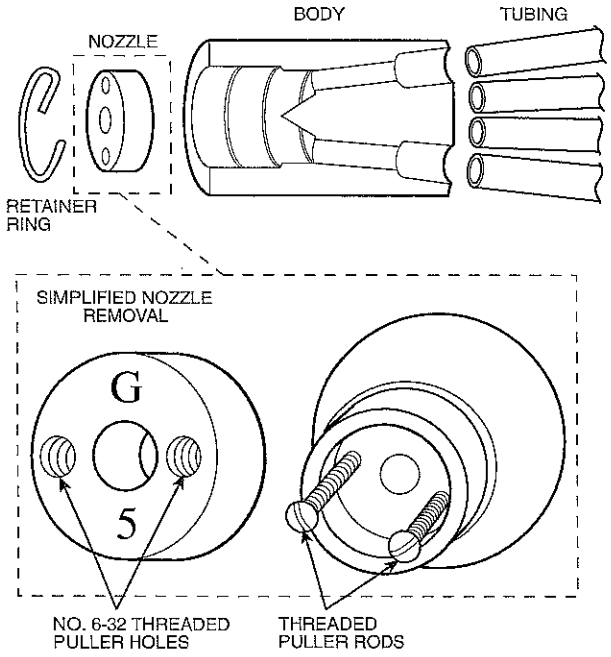


Fig. 75 — Nozzle Change-Out

Filter Drier — A filter drier should be installed before the TXV to ensure satisfactory valve operation.

Valve Location — Thermostatic expansion valves may be mounted in any position, but they should be installed as close to the evaporator as possible. If a refrigerant distributor is used with the TXV, best performance is obtained if the distributor is mounted directly to the valve outlet. If the distributor cannot be mounted directly to the valve outlet, the distance between the valve outlet and distributor should not exceed 24 in. or refrigerant distribution problems may occur. Also, the tube connecting the valve outlet and distributor can be sized smaller to maintain refrigerant velocity and better distribution. Elbows located between the expansion valve and distributor will hinder proper distribution and are, therefore, not recommended.

IMPORTANT: There are no liquid line penetrations through the casings from the factory. Best distribution is usually obtained if the expansion valve feeds vertically up or down into the distributor. Assemble the refrigerant piping and specialties inside the cabinet to determine the hole location prior to using a hole saw to penetrate the cabinet.

While not always convenient or possible, valve Types BI, F, FB, and O are easier to service if mounted in a vertical and upright position. If mounted in a horizontal position, the internal parts must be carefully reassembled to prevent damage. Some consideration should also be taken in mounting larger sized expansion valves. They must be adequately supported since system vibration and the weight of the valve can cause valve connections to fracture.

Solder Techniques — It is not necessary to disassemble solder type valves when soldering to the connecting lines. Any of the commonly used types of solders, e.g., 95-5, Sil-Fos, Easy-Flo, Phos-Copper, Stay Brite 8 or equivalents, may be used for copper-to-copper connections. When soldering a brass refrigerant distributor to the valve, appropriate solders for these connections, such as 95-5, Easy-Flo, Stay Brite 8 or equivalents must be used. Regardless of the solder used, it is important to direct the flame away from the valve body and avoid excessive heat on the diaphragm. See Fig. 76 for details. As an extra precaution, a wet cloth should be wrapped around the body and element during the soldering operation.

NOTE: This precaution will prevent overheating the valve body which could damage the superheat spring and result in flood-back problems. In addition, the Type O, EBF/SBF, and EBS valve contain synthetic parts which can be damaged due to overheating, resulting in poor valve performance.

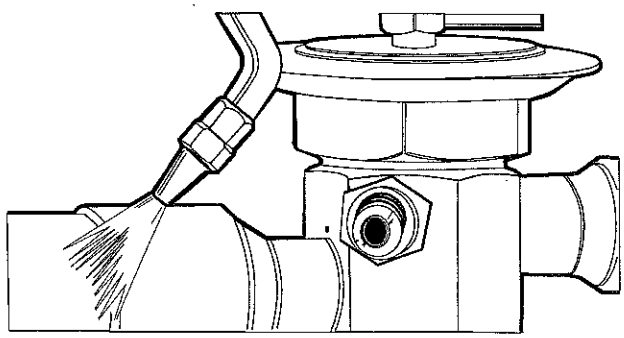


Fig. 76 — Solder Technique

Oil Return Connection — If the evaporator coil is supplied with an oil return connection at the bottom of the suction header, this small connection must be teed in ahead of the first mixing elbow and before the TXV bulb as shown in Fig. 77. The oil return line should be kept small in diameter; a 1/4-in. line will suffice in most cases. It is not necessary, when the compressor is below the evaporator, that the riser at the evaporator extends at least as high as the top level of the evaporator; after the 15-diameter riser has been provided, the suction line may elbow down immediately.

Piping loops serve to control oil accumulation in idle coil sections and prevent off cycle drain back. When the compressor is located below the evaporator the suction header should be extended above the highest point of the evaporator circuit before dropping to the compressor.

Expansion Valve Adjustment — Each Sporlan TXV is thoroughly tested and set at the factory before shipment. The factory superheat setting will be correct and no further adjustment is required for the majority of applications.

HOW TO DETERMINE SUPERHEAT CORRECTLY

1. Measure the temperature of the suction line at the bulb location.
2. Obtain the suction pressure that exists in the suction line at the bulb location by either of the following methods:
   a. If the valve is externally equalized, a gage in the external equalizer line will indicate the desired pressure directly and accurately.
   b. Read the gage pressure at the suction valve of the compressor. Add the estimated pressure drop through the suction line between bulb location and compressor suction valve to the pressure. The sum of the gage reading and the estimated pressure drop will equal the approximate suction line pressure at the bulb.
3. Convert the pressure obtained in 2a or 2b above to saturated evaporator temperature by using a temperature-pressure chart.
4. Subtract the two temperatures obtained in 1 and 3 — the difference is superheat.

HOW TO CHANGE THE SUPERHEAT SETTING — The valve should be set with the system as near as possible to design conditions. To reduce the superheat, turn the adjusting stem counterclockwise. To increase the superheat, turn the adjusting stem clockwise. When adjusting the valve, make no more than one turn of the stem at a time and observe the change in superheat closely to prevent over-shooting the desired setting. As much as 30 minutes may be required for the new balance to take place after an adjustment is made.

NOTE: Some valve bodies (G, EG, C, S, EBS and EMC) have a packing nut around the adjustment stem. It may be necessary to loosen the packing nut slightly to turn the adjusting stem. Do not forget to retighten the nut after the superheat is set.

Hot Gas Bypass — When low-load operation requires use of hot gas bypass, hot gas must be introduced between expansion valve and distributor.

Install auxiliary hot gas bypass side connector (field-supplied) in coil split that is *first-on, last-off.*

NOTE: See Table 22 for auxiliary side connector sizes. Do not attempt to use a valve that is smaller or larger than distributor size. Inserting a bushing at the outlet will defeat the purpose of the internal nozzle tube extension.

Install the side connector as follows:

1. Remove distributor nozzle and retainer ring (area A) from distributor and reinstall in inlet (area B) of side connector. See Fig. 78.
2. Solder field-supplied extension nipple to coupling on distributor, then to side connector outlet, using a silver solder or equivalent with a melting point of 1300 to 1500 F. Extension nipple should be as short as possible.
3. Solder expansion valve outlet to side connector using 95-5 tin-antimony soft solder, for easy removal.
4. If required, install field-supplied adapter bushing or coupling to connector inlet before soldering to expansion valve outlet.

Table 22 — Auxiliary Side Connector (Hot Gas Bypass) Data

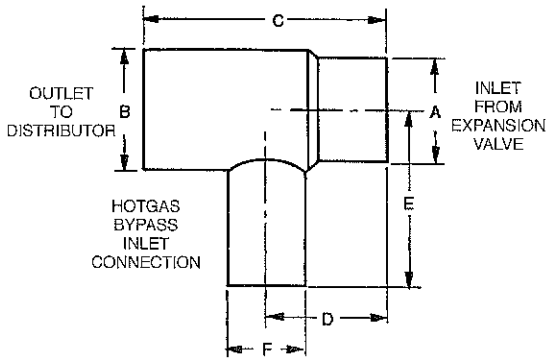
SPORLAN TYPE	CARRIER PART NO.	CONNECTION SIZES (in.)			USED WITH SPORLAN DISTRIBUTOR TYPE	NOZZLE SIZE
		Inlet — ODM Solder	Outlet — ODF Solder	Auxiliary — ODF Solder		
ASC-5-4	—	5/8	5/8	1/2	1620, 1622	J
ASC-7-4	EA19BA504	7/8	7/8	1/2	1112, 1113	G
ASC-9-5	EA19BA705	1 1/8	1 1/8	5/8	1115, 1116	E
ASC-11-7	EA19BA905	1 3/8	1 3/8	7/8	1117, 1126	C
ASC-13-9	—	1 5/8	1 5/8	1 1/8	1125, 1127, 1143	A

DIMENSIONS (in.)

SPORLAN TYPE	A	B	C	D	E	F
ASC-5-4	5/8 ODM	5/8 ODF	1.88	0.95	1.25	1/2 ODF
ASC-7-4	7/8 ODM	7/8 ODF	2.25	1.06	1.38	1/2 ODF
ASC-9-5	1 1/8 ODM	1 1/8 ODF	2.81	1.47	1.62	5/8 ODF
ASC-11-7	1 3/8 ODM	1 3/8 ODF	3.53	1.89	2.19	7/8 ODF
ASC-13-9	1 5/8 ODM	1 5/8 ODF	3.72	1.83	2.75	1 1/8 ODF

LEGEND

ODF — Outside Diameter, Female
ODM — Outside Diameter, Male



Manifolding for 2-Row Splits — Refer to Fig. 80 for coils with less than 34 tubes in face. Externally manifold as outlined for the 2-face splits with the following exceptions:

1. Manifold in pairs, the first and third coil connections for one split.
2. Manifold the second and fourth pairs of coil connections for the other split.

NOTE: Split section using first and third pairs of coil connections should be *first-on, last-off.*

Hot Gas Bypass Connection for Double-Circuited Coils — For either face or row splits connect a hot gas bypass auxiliary side connector to each distributor of coil split that is first on, last off. Refer to installation instructions for Hot Gas Bypass.

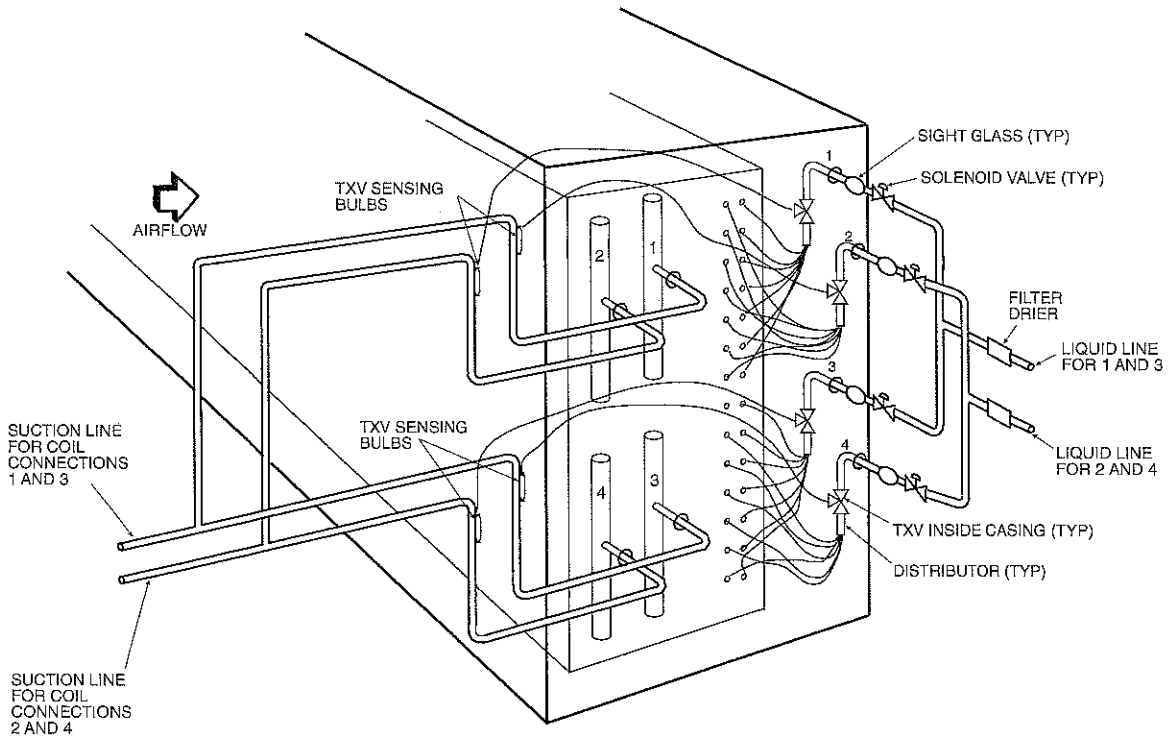
Hot Gas Bypass Piping and Wiring

INSTALL PIPING (See Fig. 81)

⚠ WARNING

Shut off all power to the unit and remove refrigerant charge using an approved refrigerant recovery device before proceeding with installation.

1. In applications where the air handler refrigerant distributor is not equipped with a side outlet connection, it is recommended that a Sporlan in-line auxiliary side connector with standard distributor be used. Refer to the installation instructions for the indoor fan coil to obtain nozzle size and distributor connection size. Select the auxiliary side connector based on this information. The side connector must be installed on refrigerant circuit no. 1 (first stage of cooling) of the fan coil being used.
2. Install a field-supplied $^1/_4$-in. NPT to $^1/_4$-in. flare fitting on the gage connection port of the compressor suction service valve.
3. Sweat the pilot solenoid valve supplied in the hot gas accessory package **directly** to the hot gas bypass valve on the $^3/_8$-in. ODF external equalizer port.
4. Install field-supplied $^1/_4$-in. copper tube (flared with a nut on each end) between the compressor suction valve and the hot gas pilot solenoid valve.
5. Connect a field-supplied $^5/_8$-in. OD copper tube between the discharge line process tube (hot gas stub) and a field-supplied manual shutoff service valve, avoiding any traps in piping.
6. Connect another field-supplied $^5/_8$-in. OD copper tube between the manual shutoff valve outlet and the hot gas bypass valve inlet.
7. Connect a field-supplied $^5/_8$-in. OD copper tube between the leaving side of the hot gas bypass valve and the Sporlan auxiliary side connector (distributor-side connector).
8. Refer to Hot Gas Bypass installation instructions for wiring information.



LEGEND

TXV — Thermostatic Expansion Valve

Fig. 80 — Row-Split Coil Manifolding (Typical)

Fan Motor Wiring Recommendations — Motors are rated for use with variable frequency drives. Full load amp (FLA) efficiency and power factors are listed in Tables 23A and 23B. Refer to Fig. 83 for fan type and application.

Motor Electrical Data — See Tables 23A and 23B for Motor Electrical Data.

Table 23A — ODP 60 Hz Motor Data

MOTOR HP	HIGH EFFICIENCY FLA 200v	230v	460v	575v	EFF. (%)	P.F. (%)	PREMIUM EFFICIENCY FLA 200v	230v	460v	575v	EFF. (%)	P.F. (%)
1/2	2.2	1.8	1.1	0.9	N/A	N/A	N/A				N/A	N/A
3/4	2.6	2.5	1.3	1.0	N/A	N/A	N/A				N/A	N/A
1	3.2	3.0	1.5	1.1	82.5	84	N/A				N/A	N/A
1 1/2	4.5	3.9	1.9	1.6	84.0	85.7	N/A				N/A	N/A
2	6.0	5.2	2.6	2.1	84.0	85.7	N/A				N/A	N/A
3	9.4	8.6	4.3	3.4	86.5	76.0	9.0	8.0	4.0	N/A	88.5	79.5
5	15.3	12.8	6.4	5.1	87.5	83.3	14.5	13.6	6.8	N/A	89.5	76.8
7 1/2	25.0	19.2	9.6	7.8	88.5	81.5	21.5	19.4	9.7	N/A	91.7	79.0
10	29.3	26.8	13.4	10.3	89.5	80.0	28.0	25.2	12.6	N/A	91.7	81.0
15	43.2	38.6	19.3	15.4	91.0	83.1	42.5	37.8	18.9	N/A	93.0	80.0
20	56.0	49.6	24.8	19.8	91.0	84.0	56.0	49.0	24.5	N/A	93.6	81.5
25	70.5	60.6	30.3	24.3	91.7	81.0	69.5	61.0	30.5	N/A	93.6	82.3
30	85.0	75.0	37.5	30.0	92.4	79.0	82.5	72.4	36.2	N/A	93.6	82.8
40	110.0	95.0	47.5	41.0	93.0	84.0	105.0	96.0	48.0	N/A	94.5	83.5
50	138.0	120.0	60.0	48.0	93.0	90.0	137.0	120.0	60.0	N/A	94.5	83.0
60	154.0	134.0	67.0	53.5	93.6	90.0	154.0	134.0	67.0	N/A	95.4	87.7
75	189.0	164.0	82.0	65.5	94.1	91.0	191.0	166.0	83.0	N/A	95.4	87.0

LEGEND

EFF. — Efficiency
FLA — Full Load Amps
ODP — Open Dripproof
P.F. — Power Factor

Table 23B — TEFC 60 Hz Motor Data

MOTOR HP	HIGH EFFICIENCY FLA 208v	230v	460v	575v	EFF. (%)	P.F. (%)	PREMIUM EFFICIENCY FLA 208v	230v	460v	575v	EFF. (%)	P.F. (%)
1/2	1.8	1.6	0.9	0.7	N/A	N/A	N/A				N/A	N/A
3/4	2.4	2.4	1.2	0.8	N/A	N/A	N/A				N/A	N/A
1	4.0	3.2	1.6	1.3	82.5	72.0	4.0	3.0	1.5	1.2	84.5	72.0
1 1/2	5.5	4.4	2.2	1.6	84.0	72.0	5.5	4.2	2.1	N/A	85.5	72.0
2	7.0	5.8	2.9	2.1	84.0	76.0	7.0	5.6	2.8	2.2	86.5	77.5
3	10.0	8.2	4.1	3.3	87.5	78.0	10.0	8.2	4.1	3.3	88.5	78.0
5	17.0	13.2	6.6	5.2	87.5	81.5	17.0	13.0	6.5	5.2	88.5	84.5
7 1/2	24.0	19.2	9.6	7.6	89.5	83.0	24.0	19.2	9.6	7.6	90.2	81.5
10	31.0	24.4	12.2	9.6	89.5	85.5	31.0	24.0	12.0	9.6	90.2	85.0
15	47.0	35.0	17.5	14.5	91.0	85.0	47.0	35.0	17.5	14.0	91.7	86.0
20	61.0	47.0	23.5	18.8	91.0	87.0	61.0	47.0	23.5	18.8	92.4	87.0
25	74.0	57.0	28.5	22.8	92.4	88.0	74.0	57.0	28.5	22.8	93.0	88.0
30	82.0	69.0	34.5	27.6	92.4	88.0	82.0	69.0	34.5	27.6	93.0	88.0
40	115.0	95.0	47.5	37.6	93.0	85.0	115.0	90.0	45.0	37.0	94.1	88.5
50	142.0	118.0	59.0	47.2	93.0	85.0	147.0	115.0	57.5	46.0	9.41	86.4
60	N/A	140.0	70.0	N/A	93.6	85.5	N/A	140.0	70.0	56.0	94.1	89.0
75	N/A	170.0	85.0	N/A	94.1	86.5	N/A	172.0	86.0	69.0	95.4	86.0

LEGEND

EFF. — Efficiency
FLA — Full Load Amps
P.F. — Power Factor
TEFC — Totally Enclosed Fan Cooled

START-UP AND TEST — Before applying power to the starter, verify that the motor overload inside the starter is set to the full load amperage (FLA or RLA) specified on the motor nameplate.

> IMPORTANT: Many starters contain a multi-tap control transformer. The line voltage tap on the control transformer must be set in the field. For starters operating at 200/230-50 Hz, 208/230-60 Hz, or 380/400/415-50 Hz, the line voltage tap on the control transformer must be set to the appropriate line input voltage.

1. Set the HOA switch on the front of the starter to the OFF position.
2. Verify that the fan can freely rotate and remove any loose items inside the fan section.
3. Close and secure the fan access door or panel and the starter door cover.
4. Apply power to the starter.
5. Set the HOA switch in the HAND position and verify that the fan operates.

   For 3-phase motors:

   Place the switch back in the OFF position and carefully open the fan access door.

   Verify that the fan wheel is rotating in the proper direction. If it is not, remove power and reverse any two of the line voltage connections at the starter terminals (L1, L2, L3).
6. With the fan operating and the starter in the HAND position, verify that each safety or limit switch functions properly.
7. Repeat Step 6 with the switch in the AUTO position and the remote contact energized.

Disconnect — When disconnect is factory-installed, it is wired to the motor, and fully tested before shipped. Open the disconnect cover and fan section access door to check for damage before proceeding.

DISCONNECT WIRING

1. Connect the field line voltage power source to the top of the disconnect (knockouts are provided).
2. Remove the knockouts as required to accommodate the field-supplied conduit.
3. Refer to the wiring diagram supplied with the unit and connect the line voltage power source to the line voltage terminals (L1, L2, L3) as shown.
4. Refer to the factory-supplied voltage warning label and verify that the power source is correct.
5. Connect the ground wire to the grounding lug provided in the disconnect.

START-UP AND TEST

1. Set the disconnect switch to the OFF position.
2. Verify that the fan can freely rotate and remove any loose items inside the fan section.
3. Close and secure the fan access door and the disconnect door cover.
4. Apply power.
5. Set the disconnect switch to the ON position and verify that the fan operates.

   For 3-phase motors:

   Place the switch back in the OFF position and carefully open the fan access door.

   Verify that the fan wheel is rotating in the proper direction. If it is not, remove power and reverse any two of the line voltage connections at the starter terminals (L1, L2, L3).

NOTE: For fused type disconnects, blown fuses MUST be replaced with the same type and size originally supplied.

VFD — When variable frequency drive (VFD) is factory-installed, it is wired to the motor and fully tested before shipment. Drive programming is also done at the factory, including electronic overload, which is programmed for the motor FLA. Refer to Tables 24 and 25.

Open the VFD front cover and the fan section access door to check for any damage before proceeding.

WIRING

1. Select a suitable location in the bottom of the VFD to connect field-supplied power source.
2. Remove the appropriate size knockout using a suitable knockout punch tool. Do NOT use a drill; metal shavings will damage the drive.
3. Connect the field-supplied conduit to the VFD enclosure.
4. Refer to the wiring diagram supplied with the VFD connect the line voltage power source to the line voltage terminals (U1, V1, W1) as shown.
5. Refer to the factory-supplied voltage warning label and verify that the power source is correct.
6. Connect the ground wire to the grounding lug provided on the bottom of the VFD.
7. Select another suitable location on the bottom of the VFD to connect the field-supplied control wiring.
8. Locate and use one of the unused knockouts on the VFD housing and connect the control wiring conduit. Refer to Fig. 84-87 for field control wiring connections.

NOTE: If a 0 to 10 or 2 to 10 vdc signal is used to control the drive speed, refer to page 16 of the ABB ACH-550 manual shipped with the drive to reset the dipswitch to the voltage or V position. Verify that the AI switch is set to the voltage position. DO NOT reprogram the drive.

START-UP AND TEST

1. Close and secure the fan access door and the VFD cover.
2. Apply power and allow drive to initialize.
3. Press the HAND button and verify that the drive operates at 8 Hz.
4. Press Up arrow to increase speed and Down arrow to decrease speed.
5. Press the Off button and verify that the fan stops.
6. Press the Auto button to operate the drive from the Energy Management System (EMS) interface. Verify that all VFD interface functions are working (start/stop, speed controls, fire/smoke, shutdown, etc.) between the VFD and the EMS.

Refer to Tables 24 and 25 for additional VFD information.

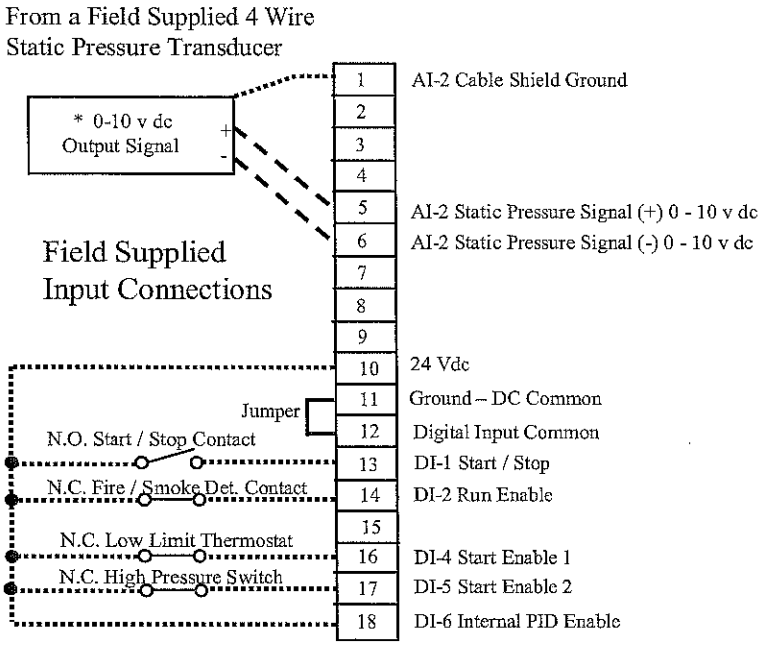
VFD with Bypass — When the VFD and bypass are factory-installed, they are wired to the motor and fully tested before shipped. The VFD is programmed at the factory as ordered, including electronic overload, which is programmed for the motor FLA (full load amps) as supplied.

Open the bypass box cover and the fan section access door to check for any damage before proceeding.

Table 25 — Air Handler Factory-Set Parameters

GROUP NUMBER	PARAMETER NUMBER	DESCRIPTION	VALUE
99	9902	Application Macro	Supply Fan
	9904	Motor Control Mode	Scalar
	9905	Motor Nominal Voltage	*
	9906	Motor Nominal Current	†
	9907	Motor Nominal Frequency	60 Hz or 50 Hz
	9908	Motor Nominal Speed	Nameplate rpm at Load
	9909	Motor Nominal Power	Nameplate Hp
10	1001	EXT1 Commands	DI-1 Start / Stop
	1002	EXT2 Commands	(0) N/A
	1003	Direction	Forward
11	1104	REF1 Minimum	9.33 Hz at 60 Hz / 7.78 Hz at 50 Hz
	1105	REF1 Maximum	62.7 Hz at 60 Hz / 52.2 Hz at 50 Hz
12	1201	Constant Speed Select	DI-3
	1202	Constant Speed Value	Field Program (8 Hz – Motor Nominal Freq.)
13	1301	Minimum AI-1	0%
	1302	Maximum AI-1	100%
	1303	Filter AI-1	1 sec
	1304	Minimum AI-2	0%
	1305	Maximum AI-2	100%
	1306	Filter AI-2	1 sec
14	1401	Relay Output 1	Started
	1402	Relay Output 2	Run
	1403	Relay Output 3	Fault (Inverted)
16	1601	Run Enable	DI-2
	1608	Start Enable 1	DI-4
	1609	Start Enable 2	DI-5
20	2003	Maximum Current	**
	2007	Minimum Frequency	8 Hz
	2008	Maximum Frequency	60 Hz / 50 Hz
21	2101	Start Function	FlyStart
	2102	Stop Function	Coast
22	2202	Accelerate Time	60 Seconds
	2203	Decelerate Time	60 Seconds
26	2605	Volt/Freq Ratio	Linear
	2606	Switching Frequency	8 KHz
	2607	Switching Frequency Control	ON
30	3006	Motor Thermal Time	1050
	3007	Motor Load Curve	105%
	3008	Zero Speed Load	70%
	3009	Break Point Frequency	35 Hz
	3010	Stall Function	Fault
	3011	Stall Frequency	20 Hz
	3012	Stall Time	20 sec
	3017	Earth Fault	Fault
31	3101	Number of Retries	2
	3102	Trial Time	600 sec
	3103	Delay Time	5 sec
	3104	AR Overcurrent	Enable
	3105	AR Overvoltage	Enable
	3106	AR Undervoltage	Enable
	3107	AR AI< Minimum	Disable
	3108	AR External Fault	(0) Disable
34	3415	Signal Parameter 3	SPEED
	3416	Signal 3 Minimum	0
	3417	Signal 3 Maximum	30000
	3418	Output 3 DSP Form	0
	3419	Output 3 DSP units	rpm
	3420	Output 3 Minimum	0
	3421	Output 3 Maximum	30000
40	4001	Gain	0.7
	4002	Integration Time	30 sec
	4005	Error Value Invert	NO
	4006	Units	Volts
	4007	Display Format	x.xxx
	4010	Setpoint Select	Internal
	4011	Internal Setpoint	Field Program (0.0 v – 10.0 v)
	4012	Setpoint Minimum	0.0 v
	4013	Setpoint Maximum	10.0 v
	4016	ACT 1 Input	AI-2
	4027	PID 1 Parameter Set	SET 1

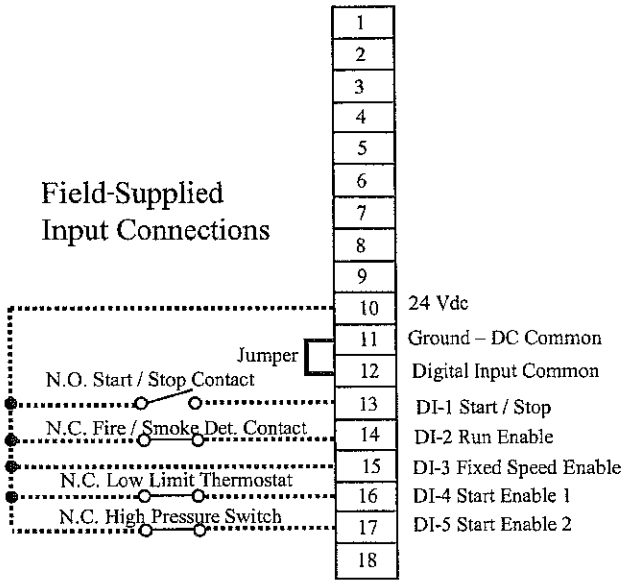
*Factory Programmed as follows: For 208-230v / 60 Hz = 208, 460v / 60 Hz = 460, 200-230v / 50 Hz = 200, 380 / 50 Hz = 400.
†Motor Nameplate Amps. Factory programmed per Table 24. This value should always be compared to the actual motor nameplate value before start-up.
**Maximum Output Amps — Factory programmed per Table 24.



*Acceptable transducer output voltage ranges are 0-10 vdc, 0-5 vdc, 1-5 vdc, and 2-10 vdc. Default sensor range is 0-10 vdc from factory. Use parameter 4008 to configure sensor low voltage and parameter 4009 to configure sensor high voltage.

NOTES:
1. All conductors are no. 22 AWG minimum.
2. Install jumpers if fire/smoke detector, low limit thermostat, start/stop or high-pressure switch are not required.
3. Program static pressure control set point using parameter 4011 in volts dc.

Fig. 86 — Field Wiring for Stand-Alone Static Pressure Control with 4-Wire Static Pressure Transducer (Voltage Output)



NOTES:
1. All conductors are no. 22 AWG (American Wire Gage) minimum.
2. Install jumpers if fire/smoke detector, low limit thermostat, or high pressure switch are not required.
3. Program desired speed setpoint in Hz using parameter 1202.

Fig. 87 — Field Wiring for High Inertia/Low Horsepower Applications Using VFD as a Starter

VFD Configuration — The VFD keypad is shown in Fig. 89. The function of SOFT KEYS 1 and 2 change depending on what is displayed on the screen. The function of SOFT KEY 1 matches the word in the lower left-hand box on the display screen. The function of SOFT KEY 2 matches the word in the lower right-hand box on the display screen. If the box is empty, then the SOFT KEY does not have a function on that specific screen. The UP and DOWN keys are used to navigate through the menus. The OFF key is used to turn off the VFD. The AUTO key is used to change control of the drive to automatic control. The HAND key is used to change control of the drive to local (hand held) control. The HELP button is used to access the help screens.

START-UP WITH ASSISTANT — The initial start-up has been performed at the factory. To start up the VFD with the Start-Up Assistant, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight ASSISTANTS on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP or DOWN keys to highlight Commission Drive and press SEL (SOFT KEY 2).
4. The Start-Up Assistant will display the parameters that need to be configured. Select the desired values and press SAVE (SOFT KEY 2) after every change. The process will continue until all the parameters are set.

START-UP BY CHANGING PARAMETSERS INDIVIDUALLY — Initial start-up is performed at the factory. To start up the VFD with by changing individual parameters, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight PARAMETERS on the display screen and press ENTER (SOFT KEY 2).
3. Use the UP and DOWN keys to highlight the desired parameter group and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to highlight the desired parameter and press EDIT (SOFT KEY 2).
5. Use the UP or DOWN keys to change the value of the parameter.
6. Press SAVE (SOFT KEY 2) to store the modified value. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
7. Choose another parameter or press EXIT (SOFT KEY 1) to return to the listing of parameter groups. Continue until all the parameters have been configured and then press EXIT (SOFT KEY 1) to return to the main menu.

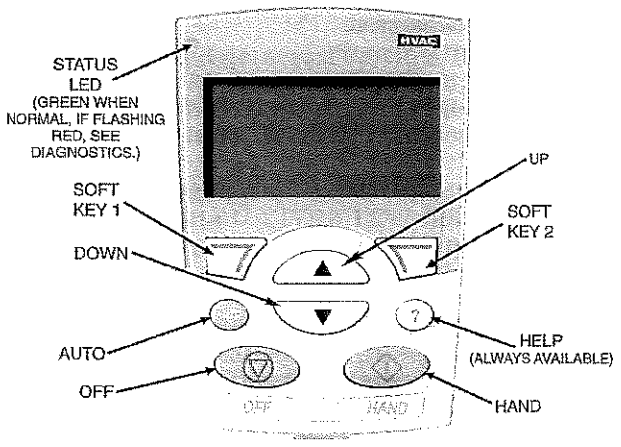


Fig. 89 — VFD Keypad

NOTE: The current parameter value appears above the highlight parameter. To view the default parameter value, press the UP and DOWN keys simultaneously. To restore the default factory settings, select the application macro "HVAC Default."

VFD Modes — The VFD has several different modes for configuring, operating, and diagnosing the VFD. The modes are:

- standard display mode — shows drive status information and operates the drive
- parameters mode — edits parameter values individually
- start-up assistant mode — guides the start up and configuration
- changed parameters mode — shows all changed parameters
- drive parameter backup mode — stores or uploads the parameters
- clock set mode — sets the time and date for the drive
- I/O settings mode — checks and edits the I/O settings

Standard Display Mode — Use the standard display mode to read information on the drive status and operate the drive. To reach the standard display mode, press EXIT until the LCD display shows status information as described below. See Fig. 90.

The top line of the LCD display shows the basic status information of the drive. The HAND icon indicates that the drive control is local from the control panel. The AUTO icon indicates that the drive control is in remote control mode through the I/O.

The arrow icon indicates the drive and motor rotation status. A rotating arrow (clockwise or counterclockwise) indicates that the drive is running. A rotating blinking arrow indicates that the drive is running but not at set point. A stationary arrow indicates that the drive is stopped. For Carrier air handler units, the rotation is always forward.

Using parameter group 34, the middle of the LCD display can be configured to display 3 parameter values. The default display shows parameters 0103 (OUTPUT FREQ) in Hz, 0104 (CURRENT) in amperes, and AI1 (Analog Input 1) in revolutions per minute.

The upper right hand corner shows the frequency set point that the drive will maintain.

The bottom corners of the LCD display show the functions currently assigned to the two soft keys. The lower middle displays the current time (if configured to show the time).

The first time the drive is powered up, it is in the OFF mode. To switch to local hand-held control and control the drive using the control pane, press the HAND or AUTO buttons. Pressing the HAND button switches the drive to hand control while keeping the drive running. Pressing the AUTO button switches the drive to remote input control. The OFF button stops the drive. To return to auto control, press the AUTO button. To start the drive press the HAND or AUTO button, to stop the drive press the OFF button.

To adjust the speed set point while in HAND mode, press the UP or DOWN buttons (the reference changes immediately). The reference can be modified in the local control (HAND) mode, and can be parameterized (using Group 11 reference select) to also allow modification in the remote control mode.

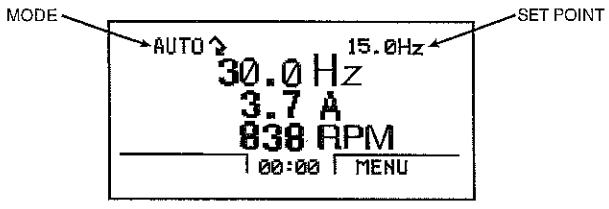


Fig. 90 — Standard Display Example

7. Use the UP or DOWN keys to highlight DATE FORMAT and press SEL (SOFT KEY 2). Use the UP or DOWN keys to change the parameter setting. Press OK (SOFT KEY 2) to save the configuration and return to the Clock Set menu.
8. Press EXIT (SOFT KEY 1) twice to return to the main menu.

I/O Settings Mode — The I/O Settings mode is used for viewing and editing the I/O settings.

To configure the I/O settings, perform the following procedure:

1. Select MENU (SOFT KEY 2). The Main menu will be displayed.
2. Use the UP or DOWN keys to highlight I/O SETTINGS on the display screen and press ENTER (SOFT KEY 2). The I/O Settings parameter list will be displayed.
3. Use the UP or DOWN keys to highlight the desired I/O setting and press SEL (SOFT KEY 2).
4. Use the UP or DOWN keys to select the parameter to view. Press OK (SOFT KEY 2).
5. Use the UP or DOWN keys to change the parameter setting. Press SAVE (SOFT KEY 2) to save the configuration. Press CANCEL (SOFT KEY 1) to keep the previous value. Any modifications that are not saved will not be changed.
6. Press EXIT (SOFT KEY 1) twice to return to the main menu.

Electric Heaters — Electric heaters are factory installed. If circumstances require field installation of an electric heater, it can only be installed in a factory-supplied EHS (Electric Heat section). Installation of electric heat in a section other than an EHS section will void the UL listing of the product.

1. Identify ALL electrical power supplies serving the unit, lock off and tag each before working on the unit.
2. Locate the electric heat section mounted on the unit and remove the protective shipping cover.
3. Identify the electric heater and verify the heater matches the unit. Unit hand and heater hand must also agree.
4. Properly sized power wiring and control wiring entry holes are provided in the upstream sidewall of the heater control box.

   A narrow, fixed upstream panel is provided for electrical power entry from the outside. Power may also enter the unit from below, penetrating the floor of the unit. Carefully seal all entries, weathertight where necessary. Control wiring may enter the same way as electrical wiring.

   Take future service requirements into account when locating field power entry holes in the unit casing.
5. Sleeve these holes and seal around the conduit to preserve the integrity of the casing. In some cases, it might be preferable for the power to actually enter the cabinet through an adjacent section, or enter the control box from another angle, which is acceptable.
6. If the original holes are not used, they must be appropriately plugged.
7. Insert the electric heater into the section (the heater element rack will be located along the leaving air side of the section).

NOTE: If the heater must be hoisted into position, once the top panel has been removed to a safe place, the horizontal top rail may be removed by carefully removing the flat corner plug from the end corner pieces and extracting the screw visible within the exposed cavity. (Do not mix these screws with others, as they are specific for this location.) The corners may then be separated, lifting the rail and corner segments away from the unit at approximately a 45-degree angle, taking care not to damage the double bulb seal.

8. The heater has lifting hook openings on each end. When the heater is within 3 in. of its final position, reinstall the crossrail, with the box-seal facing down, and panel seal toward the top.
9. Secure the heater to the section posts and rails with the furnished screws, drawing it the last $^3/_8$ in. into final sealed position against the framework, by alternately cross tightening the screws. The opposite end of the heater rests on lateral spacers provided on the floor panel, and is retained by a screw through an angle clip on the last one or by an upright corner flange.
10. Replace the top panel, and proceed to complete the wiring in accord with all applicable codes and ordinances. The wiring diagram is fastened inside the control box, with a spare, loose copy provided as a convenience for maintenance manual preparation. Do not mix the wiring diagrams, as they are specific for each unit.
11. Connect power and control wiring according to the wiring diagram supplied (see Fig. 91 for typical wiring details).

CONNECT POWER AND CONTROL WIRES — Heater wiring schematic is located on control box panel. Verify minimum airflow requirement (minimum coil face velocity, fpm) will be met, especially on applications where variable air volume is supplied.

Use copper power supply wires rated for 75 C minimum. On 250 v or greater applications, use 600 v rated wiring. Size wires to carry 125% of current load on each set of terminals. Use the following formulas as required:

$$\text{Single-phase line current} = \frac{(\text{kW per set of terminals})\,(1000)}{\text{voltage}}$$

$$\text{Three-phase line current} = \frac{(\text{kW per set of terminals})\,(1000)}{(\text{voltage})\,(1.73)}$$

Note that if the heater is rated at 50 kW (or more) and is controlled by a cycling device such as a multi-stage thermostat, or a step controller, conductors may be sized at 100% of load amperes (see Table 26) per NEC Section 424-22. Heater construction and application information are based upon Space Heating Standard UL No. 1096 and the requirements of the NEC. Installer is responsible for observing local code requirements.

Install a disconnect switch or main circuit breaker in accordance with NEC and other applicable codes. Locate so that it is easily accessible and within sight of heater control box (per NEC Article 424-19 and 424-65).

Weatherproof junction boxes have no knockouts for wire entrance. Provide knockouts for all wiring using field-supplied grommets of correct size and type of conduit as required.

Where field-supplied thermostats are used, isolate circuits to prevent possible interconnection of control circuit wiring.

Where field-supplied step controller is used, connect steps to terminals as marked on wiring schematic. When connecting multi-stage heaters, wire stage no. 1 so that it is first stage on, last stage off.

Provide sufficient clearance for convection cooling of heaters with solid-state controllers. Provide at least 5-in. of free air space above and below cooling fins extending from heater terminal box. Be sure to connect interlock terminals F1 and F2 to auxiliary contacts on fan starter.

Table 27 — Electric Heater Data

39M UNIT SIZE	HEATER AREA (sq ft)	NO. OF CONTROL STEPS*	HEATER COIL kW	NOMINAL COIL FACE VELOCITY (fpm)	TEMP RISE (F)	208/3/60 VOLTS				240/3/60 VOLTS				480/3/60 VOLTS				600/3/60 VOLTS				380/3/50 VOLTS			
						Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP
03	3	3	5	500	11	14	17	1	20	12	15	1	20	6	8	1	20	5	6	1	20	8	10	1	20
			10	500	21	28	35	1	35	24	30	1	35	12	15	1	20	10	12	1	20	15	19	1	20
			15	500	32	42	52	1	60	36	45	1	50	18	23	1	25	14	18	1	20	23	29	1	30
			20	500	43	56	69	2	70	48	60	2	70	24	30	1	35	19	24	1	25	30	38	1	40
			25	500	53	69	87	2	90	60	75	2	80	30	38	1	40	24	30	1	35	38	48	1	50
			30	500	64	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			35	500	75	97	122	3	125	84	105	2	110	42	53	1	60	34	42	1	45	53	67	2	70
06	5.2	3	10	500	12	28	35	1	35	24	30	1	35	12	15	1	20	10	12	1	20	15	19	1	20
			15	500	18	42	52	1	60	36	45	1	50	18	23	1	25	14	18	1	20	23	29	1	30
			20	500	25	56	69	2	70	48	60	2	70	24	30	1	35	19	24	1	25	30	38	1	40
			30	500	37	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			40	500	49	111	139	3	150	96	120	3	125	48	60	2	70	39	48	1	50	61	76	2	80
			50	500	61	139	174	3	175	120	151	3	175	60	75	2	80	48	60	2	70	76	95	2	100
			60	500	74	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
08	7.4	3	20	500	17	56	69	2	70	48	60	2	70	24	30	1	35	19	24	1	25	30	38	1	40
			30	500	26	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			40	500	35	111	139	3	150	96	120	3	125	48	60	2	70	39	48	1	50	61	76	2	80
			50	500	43	139	174	3	175	120	151	3	175	60	75	2	80	48	60	2	70	76	95	2	100
			60	500	52	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	70	500	60	195	243	5	250	169	211	4	225	84	105	2	110	67	84	2	90	106	133	3	150
			80	500	69	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
10	9.9	3	20	500	13	56	69	2	70	48	60	2	70	24	30	1	35	19	24	1	25	30	38	1	40
			30	500	19	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			40	500	26	111	139	3	150	96	120	3	125	48	60	2	70	39	48	1	50	61	76	2	80
			50	500	32	139	174	3	175	120	151	3	175	60	75	2	80	48	60	2	70	76	95	2	100
			60	500	39	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	75	500	48	208	261	5	300	181	226	4	250	90	113	2	125	72	90	2	100	114	143	3	150
			90	500	58	250	313	6	350	217	271	5	300	108	135	3	150	87	108	2	110	137	171	3	175
			100	500	65	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
12	12.4	3	20	500	10	56	69	2	70	48	60	2	70	24	30	1	35	19	24	1	25	30	38	1	40
			30	500	15	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			40	500	21	111	139	3	150	96	120	3	125	48	60	2	70	39	48	1	50	61	76	2	80
			50	500	26	139	174	3	175	120	151	3	175	60	75	2	80	48	60	2	70	76	95	2	100
			60	500	31	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	80	500	41	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	52	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			115	500	—	—	—	—	—	—	—	—	—	138	173	3	175	111	138	3	150	175	219	4	225
			130	500	—	—	—	—	—	—	—	—	—	157	196	4	200	125	157	3	175	198	247	5	250
14	13.6	3	30	500	14	83	104	2	110	72	90	2	100	36	45	1	50	29	36	1	40	46	57	1	60
			45	500	21	125	156	3	175	108	135	3	150	54	68	2	70	43	54	1	60	68	86	2	90
			60	500	28	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
		6	80	500	38	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	47	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			115	500	54	—	—	—	—	—	—	—	—	138	173	3	175	111	138	3	150	175	219	4	225
			130	500	61	—	—	—	—	—	—	—	—	157	196	4	200	125	157	3	175	198	247	5	250
			150	500	70	—	—	—	—	—	—	—	—	181	226	4	250	145	181	4	200	228	—	5	300

LEGEND

ARI — Air Conditioning and Refrigeration Institute
AWG — American Wire Gage
FLA — Full Load Amps
kW — Kilowatts
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection

*Standard control steps are listed under the Control Step heading. "Free" additional steps of control are optionally available when the number of subcircuits exceeds the standard number of control steps.
†MCA = 1.25 x FLA; for proper wire sizing, refer to Table 310-16 of the NEC (National Electrical Code).

NOTES:
1. Subcircuits are internal heater circuits of 48 amps or less.
2. Electric heat performance is not within the scope of ARI standard 430 certification.
3. To avoid damage due to overheating, minimum face velocity cannot fall below 350 fpm.
4. Heaters up to (and including) 60 kW have 3 control steps; beyond 60 kW, 6 steps are standard.

Table 27 — Electric Heater Data (cont)

39M UNIT SIZE	HEATER AREA (sq ft)	NO. OF CONTROL STEPS*	HEATER COIL kW	NOMINAL COIL FACE VELOCITY (fpm)	TEMP RISE (F)	208/3/60 VOLTS				240/3/60 VOLTS				480/3/60 VOLTS				600/3/60 VOLTS				380/3/50 VOLTS			
						Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP	Total FLA	MCA†	No. Sub Ckt	MOCP
36	38	6	60	500	10	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			80	500	13	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	17	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	21	—	—	—	—	—	—	—	—	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	25	—	—	—	—	—	—	—	—	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	29	—	—	—	—	—	—	—	—	211	263	5	300	169	211	4	225	266	333	6	350
			200	500	34	—	—	—	—	—	—	—	—	241	301	6	350	193	241	5	250	304	380	7	400
			225	500	38	—	—	—	—	—	—	—	—	271	339	6	350	217	271	5	300	342	428	8	450
			250	500	42	—	—	—	—	—	—	—	—	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	50	—	—	—	—	—	—	—	—	361	452	8	500	289	361	7	400	—	—	—	—
			350	500	59	—	—	—	—	—	—	—	—	421	527	9	600	337	421	8	450	—	—	—	—
40	41.9	6	60	500	9	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			80	500	12	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	15	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	19	—	—	—	—	—	—	—	—	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	23	—	—	—	—	—	—	—	—	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	27	—	—	—	—	—	—	—	—	211	263	5	300	169	211	4	225	266	333	6	350
			200	500	30	—	—	—	—	—	—	—	—	241	301	6	350	193	241	5	250	304	380	7	400
			250	500	38	—	—	—	—	—	—	—	—	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	46	—	—	—	—	—	—	—	—	361	452	8	500	289	361	7	400	—	—	—	—
			350	500	53	—	—	—	—	—	—	—	—	421	527	9	600	337	421	8	450	—	—	—	—
			400	500	61	—	—	—	—	—	—	—	—	482	602	11	700	385	482	9	500	—	—	—	—
50	52.6	6	60	500	7	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			80	500	10	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	12	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	15	—	—	—	—	—	—	—	—	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	18	—	—	—	—	—	—	—	—	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	21	—	—	—	—	—	—	—	—	211	263	5	300	169	211	4	225	266	333	6	350
			200	500	24	—	—	—	—	—	—	—	—	241	301	6	350	193	241	5	250	304	380	7	400
			250	500	30	—	—	—	—	—	—	—	—	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	36	—	—	—	—	—	—	—	—	361	452	8	500	289	361	7	400	—	—	—	—
			350	500	42	—	—	—	—	—	—	—	—	421	527	9	600	337	421	8	450	—	—	—	—
			400	500	49	—	—	—	—	—	—	—	—	482	602	11	700	385	482	9	500	—	—	—	—
			450	500	55	—	—	—	—	—	—	—	—	—	—	—	—	434	542	10	600	—	—	—	—
			500	500	61	—	—	—	—	—	—	—	—	—	—	—	—	482	602	11	700	—	—	—	—
61	63.1	6	60	500	6	167	208	4	225	145	181	4	200	72	90	2	100	58	72	2	80	91	114	2	125
			80	500	8	222	278	5	300	193	241	5	250	96	120	3	125	77	96	2	100	122	152	3	175
			100	500	10	278	347	6	350	241	301	6	350	120	151	3	175	96	120	3	125	152	190	4	200
			125	500	13	—	—	—	—	—	—	—	—	151	188	4	200	120	151	3	175	190	238	4	250
			150	500	15	—	—	—	—	—	—	—	—	181	226	4	250	145	181	4	200	228	285	5	300
			175	500	18	—	—	—	—	—	—	—	—	211	263	5	300	169	211	4	225	266	333	6	350
			200	500	20	—	—	—	—	—	—	—	—	241	301	6	350	193	241	5	250	304	380	7	400
			250	500	25	—	—	—	—	—	—	—	—	301	376	7	400	241	301	6	350	380	475	8	500
			300	500	30	—	—	—	—	—	—	—	—	361	452	8	500	289	361	7	400	—	—	—	—
			350	500	35	—	—	—	—	—	—	—	—	421	527	9	600	337	421	8	450	—	—	—	—
			400	500	40	—	—	—	—	—	—	—	—	482	602	11	700	385	482	9	500	—	—	—	—
			450	500	46	—	—	—	—	—	—	—	—	—	—	—	—	434	542	10	600	—	—	—	—
			500	500	51	—	—	—	—	—	—	—	—	—	—	—	—	482	602	11	700	—	—	—	—

LEGEND

ARI — Air Conditioning and Refrigeration Institute
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FLA — Full Load Amps
kW — Kilowatts
MCA — Minimum Circuit Amps
MOCP — Maximum Overcurrent Protection

*Standard control steps are listed under the Control Step heading. "Free" additional steps of control are optionally available when the number of subcircuits exceeds the standard number of control steps.
†MCA = 1.25 x FLA; for proper wire sizing, refer to Table 310-16 of the NEC (National Electrical Code).

NOTES:
1. Subcircuits are internal heater circuits of 48 amps or less.
2. Electric heat performance is not within the scope of ARI standard 430 certification.
3. To avoid damage due to overheating, minimum face velocity cannot fall below 350 fpm.
4. Heaters up to (and including) 60 kW have 3 control steps; beyond 60 kW, 6 steps are standard.

ERV WHEEL MOTOR WIRING — All ERV wheel motors have stripped back power leads. For units with 3-phase wheel motors, install and route the proper wire type and size directly to the motor junction box provided.

For units with single-phase wheel motors connections must be made in a separate, field-installed junction box. This junction box must be installed in the ERV section close to the motor.

Refer to Table 28 for motor electrical data.

Table 28 — Electrical Requirements for Energy Wheel Motor

MOTR VOLTS-PHASE-Hz	39M UNIT SIZES	MOTOR HP	MOTOR AMPS (a)
115-1-50/60	03, 06	80 w	0.7
200-230/460-3-60	08, 10	1/6	1.03-1.04/0.52
	12, 14, 17, 21	1/6	0.80-0.75/0.38
	25, 30	1/4	2.3-2.5/1.2
200/400-3-50	08, 10	1/6	1.04/0.52
	12, 14, 17, 21	1/6	0.80/0.40
	25, 30	1/3	3.4/1.8
575-3-60	08, 10, 12,14 17, 21	1/6	0.3
	25, 30	1/3	1.4

START-UP

Checklist — Remove all construction debris from unit interior. Verify that all drains are free of debris. Prime all condensate traps.

FILTERS — Install unit filters in all filter sections.

AIRFOIL AND FORWARD-CURVED FANS

1. Release the holddown that fastens the fan sled to the section base on isolated units.
2. Check lubrication of fan, motor bearings, and linkages.
   a. Note that bearings are shipped completely full of grease for corrosion protection and may run warm temporarily on start-up until excess grease has discharged.
   b. Hand operate all linkages, such as damper and guide vanes, to check for freedom of movement.
3. Check tightness of bearing setscrews or locking collars (Fig. 95). Also, check tightness of setscrews on fan wheels and sheaves.
4. Check tightness of fan-shaft bearing mounting. See Fig. 95.
5. Recheck sheave alignment and belt tension. (Refer to Fig. 37 and 38.)
6. Hand turn fan to make certain fan wheel does not rub in housing.
7. Check fan speed with a strobe-type tachometer or use the following formula:

   Obtain the motor rpm from the fan motor nameplate and read sheave pitch diameters marked on the fan and motor pulleys, or approximate the pitch diameters by using the pulley ODs.

   Then:

$$\text{Fan RPM} = \frac{\text{Motor Rpm x Motor Sheave Pitch Diameter (in.)}}{\text{Fan Sheave Pitch Diameter (in.)}}$$

Example:		Actual	Approximate
Nameplate Motor RPM	=	1760	1760
Motor Sheave Pitch Diameter	=	8.9	9.0 (OD)
Fan Sheave Pitch Diameter	=	12.4	12.5 (OD)
Fan RPM	=	1760 x 8.9	1760 x 9.0
	=	12.4	12.5
	=	1263 RPM	= 1267 RPM

   Refer to Tables 2A-2D for maximum allowable fan speeds for fan wheels. Excessive fan speed may result in condensate carryover from cooling coil or fan motor overload and wheel failure.
8. Check direction of rotation (see Fig. 83). Arrow on drive side of fan housing indicates correct direction of rotation.

⚠ CAUTION

Drive ratios of 1:1 may cause excessive vibration. Avoid if possible.

9. Check vibration. If excessive vibration occurs, check for the following:
   a. Variable sheave (if air balance of system has been accomplished; replace sheave with fixed sheave for continuous application).
   b. Drive misalignment.
   c. Mismatched, worn, or loose belts.
   d. Wheel or sheaves loose on shaft.
   e. Loose bearings.
   f. Loose mounting bolts.
   g. Motor out of balance.
   h. Sheaves eccentric or out of balance.
   i. Vibration isolators improperly adjusted.
   j. Out-of-balance or corroded wheel (rebalance or replace if necessary).
   k. Accumulation of material on wheel (remove excess material).

Steam Coil

1. Generate steam in the steam main and open the supply (gate) valve to the coil.
2. Thoroughly preheat the coil with steam before starting fans, especially when inlet air temperature is below freezing. If water hammer occurs, turn off fans until condensate trapped in coils is reduced by heat and steam pressure.
3. Ensure continuous-vent petcock is open; also check operation of gate valves, control valve, and check valves.
4. After operating coil for 50 hours, check strainer and remove any foreign matter. Check traps and drip lines for correct condensate removal. Where necessary, increase the pitch of lines to increase condensate drainage. (Recheck operation after 50 hours and repeat if necessary.)

INTEGRAL FACE AND BYPASS COIL START-UP — Ensure that the damper operator allows the dampers to fully close the face and reverses to fully close the bypass. Set the thermostat so that the face opens and bypass closes when heat is required.

On start-up, the steam or hot water supply will be fully expanded prior to start of airflow. Allow time for all air to be purged from the system and for the heating surface to fully warm up in order to avoid heating lag.

Preheating a cold system will avoid excessive steam condensate loading at the start of operation of a steam heating system. It also protects steam and hot water units against freezing up when subject to sub-freezing air temperatures. After preheating, fully open the dampers for full-face exposure (bypass closed). Start airflow. Set thermostat for desired air temperature.

ELECTRIC HEATERS

1. Check tightness of all electrical connections.
2. Remove heater circuit fuses.
3. Turn on power to activate transformer.
4. Start up base unit fans. Check airflow and switches. Refer to base unit instructions as required.
5. Set thermostats so that heater contactors will operate.
6. Shut off unit power.
7. Reinstall fuses.
8. Turn on unit power and heater power.

Energy Recovery Wheel

⚠ CAUTION

Keep hands away from rotating wheel. Contact with rotating wheel can cause physical injury.

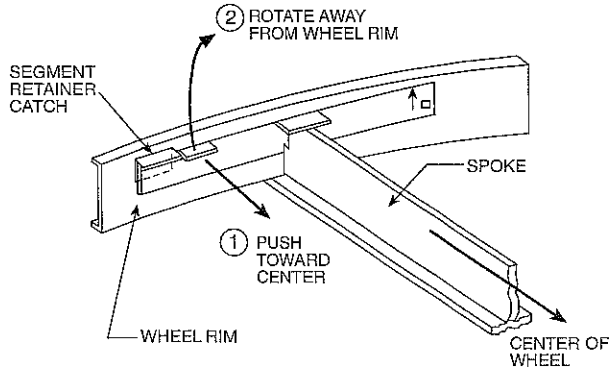


Fig. 96 — Segment Retainer

1. By hand, turn the wheel clockwise (as viewed from the pulley side), to verify that the wheel turns freely through a full 360-degree rotation.
2. Before applying power to the drive motor, confirm that the wheel segments are fully engaged in the wheel frame and that the segment retainers are completely fastened. (See Fig. 96).
3. With hands and objects away from moving parts, activate the unit and confirm wheel rotation. The wheel rotates clockwise (as viewed from the pulley side).
4. If the wheel has difficulty starting, turn the power off and inspect for excessive interference between the wheel surface and each of the four (4) diameter seals. To correct, loosen the diameter seal adjusting screws and back adjustable diameter seals away from the surface of the wheel, apply power to confirm that the wheel is free to rotate, then re-adjust and tighten the hub and diameter seals according to the instructions in the Service section.
5. Start and stop the wheel several times to confirm seal adjustment and to confirm that the belt is tracking properly on the wheel rim (approximately $^1/_4$-in. from outer edge of rim).

ZEROING THE MAGNEHELIC GAGE BEFORE START-UP — While power is off, set the indicating pointer exactly on the zero mark using the external zero adjust screw on the cover at the bottom. Note that the zero check or adjustment can only be made while the high and low pressure taps are both open to atmosphere.

SERVICE

⚠ CAUTION

Electric shock hazard. Disconnect power before entering or servicing.

More than one disconnect switch may be required to deenergize the equipment.

General

1. Review Safety Considerations at beginning of these instructions. Good safety habits are important tools when performing service procedures.
2. To make speed measurements, use a strobe-style tachometer or calculate per Step 7 of Start-Up, Checklist for Airfoil and Forward-Curved Fans.

Electric Heaters — At least once a year at start of operating season or whenever unit is serviced, check field and factory-made electrical connections for tightness. Also periodically clean filters, fan, airways, ductwork, grilles, and registers as required. Differential air pressure switch is factory set to open at 0.07 in. wg, close at 0.05 in. wg and requires no adjustment.

Refer to the Troubleshooting section for more information. Heater electrical data is shown in Table 27.

Fan Motor Replacement

1. Shut off motor power.
2. Disconnect and tag power wires at motor terminals.
3. Loosen motor brace-to-mounting-rail attaching bolts. Loosen belt tensioning bolts to adjust the motor position so V-belts can be removed without stretching over grooves.
4. Mark belt as to position. Remove and set aside belts.
5. Remove motor to motor bracket holddown bolts.

CASSETTE REPLACEMENT

1. Inspect the replacement cassette for freight damage upon receipt. Inspect the cassette frame, wheel assembly and segments for damage and verify that the wheel turns freely by hand (clockwise when viewed from pulley side). Report any damage immediately to the freight company.
2. Handle ERV cassettes with care. Lift by the bearing support beam. Holes are provided on both sides of the bearing support beams to facilitate rigging (Fig. 99).
3. Remove the ERV section side access panel.
4. Refer to Fig. 98. Remove wheel center partition hold-down bracket (1).
5. Lift and Remove wheel center partition (2).
6. Remove the upper (3) and lower (4) wheel retainer angles, being careful wheel does not tip and fall out.
7. Slide wheel cassette out of frame (toward main AHU), and out side of unit (5).
8. The new ERV section may be mounted in any orientation. However, *make certain that the frame remains flat and the bearing beams are not racked as shown in Fig. 100.*
9. To ensure that the beams are not racked, check that the distance between the wheel rim and bearing beam is the same at each end of the bearing beam, to within $^1/_4$ of an inch (dimension A and B in Fig. 100). Bearing beam racking of as little as .040 inches (Dim C in Fig. 100) will cause the wheel to tilt $^3/_{16}$ in. at the rim. Adjusting the diameter seals (Fig. 101) will compensate for up to $^1/_4$ in. of racking.

   NOTE: If racking is greater than $^1/_4$ in., it must be corrected to ensure that the drive belt will not disengage from the wheel.
10. Wheel sections installed at angles greater than 30 degrees from vertical will require seal adjustment (Fig. 101). Adjust the diameter seals to avoid excessive wheel drag. A final check of seal adjustment is recommended for all designs.

ADJUSTING AIR SEALS — Four adjustable diameter seals are provided on each cassette to minimize air transfer between the counterflowing airstreams.

To adjust diameter seals:

1. Loosen the diameter seal adjusting screws and back seals away from wheel surface (Fig. 101).
2. Rotate the wheel clockwise until two opposing spokes are hidden behind the bearing support beam.
3. Using a folded piece of paper as a feeler gauge, position the paper between the wheel surface and the diameter seals.
4. Adjust the seals towards the wheel surface until a slight friction on the feeler gauge (paper) is detected when the gauge is moved along the length of the spoke.
5. Retighten the adjusting screws and recheck clearance with the feeler gauge.

SEGMENT INSTALLATION AND REPLACEMENT — Wheel segments are secured to the wheel frame by a segment retainer, which pivots on the wheel rim and is held in place by a segment retaining catch (Fig. 102).

To install wheel segments follow the steps below and refer to Fig. 102.

1. Unlock two segment retainers, one on each side of the selected segment opening.
2. With the embedded stiffener facing the motor side, insert the nose of the segment between the hub plates.

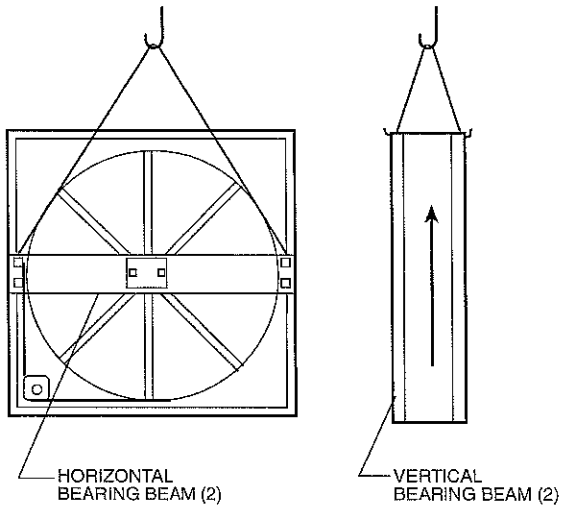


Fig. 99 — Lifting Hole Locations

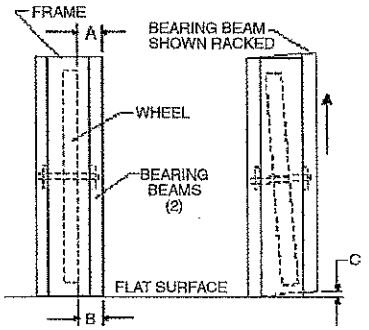


Fig. 100 — Avoid Racking of Frame

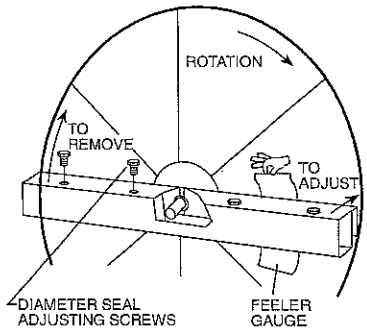


Fig. 101 — Diameter Seal Adjustment

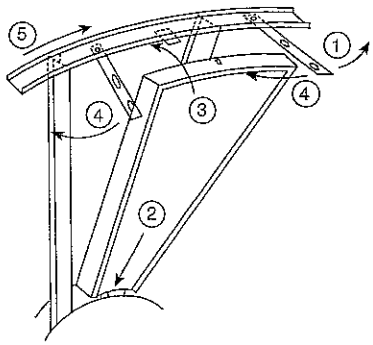


Fig. 102 — Segment Installation

4. Rotate the wheel clockwise while feeding belt onto wheel rim (be careful not to twist belt) until taped end returns to pulley location. Remove tape from wheel.
5. Link belt ends together with belt wrapped around wheel (Fig. 106).
6. Rotate wheel clockwise to position connector approximately 180 degrees from pulley location.
7. At pulley location, insert the right angle belt retaining clip near spoke and between segment retainer latch and wheel rim as shown in Fig. 107.

IMPORTANT: To avoid release of segment retainer latch, do not insert retaining clip on other side of spoke.

8. Rotate wheel counterclockwise until belt retaining clip is within a few inches of the wheel bearing beam (see Fig. 108).
9. Lift and remove the belt from the wheel rim between a point opposite the pulley and belt retaining clip and stretch over pulley (see Fig. 109).
10. Rotate wheel clockwise until the belt is fully stretched onto pulley and wheel rim.
11. Remove belt retaining clip and rotate wheel by hand two rotations while observing that belt is not twisted as it enters pulley. Also ensure that belt is tracking midway between outer edge of rim and seal plate, or in belt guide channel where provided.
12. Apply power to cassette and observe belt tracking under power.

OTHER MAINTENANCE

Wheel Drive Motor Bearings are pre-lubricated and no further lubrication is necessary.

The Wheel Drive Pulley is secured to the drive motor shaft by a combination of either a key or D-slot and set screw. The set screw is secured with removable locktite to prevent loosening. Annually confirm that the set screw is secure.

The Wheel Drive Belt is a urethane stretch belt designed to provide constant tension through the life of the belt. No adjustment is required. Inspect the drive belt annually for proper tracking and tension. A properly tensioned belt will turn the wheel immediately after power is applied with no visible slippage during start-up.

Cleaning Unit Interior/Exterior — Unit interior/exterior panels should be wiped down using a damp soft cloth or sponge with a mixture of warm water and a mild detergent. Avoid using an abrasive cleaner, as damage to the paint could occur resulting in rust and corrosion. Chemicals such as paint thinners can damage the painted panels and should be avoided.

⚠ CAUTION

Avoid washing unit electrical devices such as motors, starters, electric heater control boxes, damper/valve actuators, sensors, switches, relays, etc. as serious personal injury or damage to the device could result.

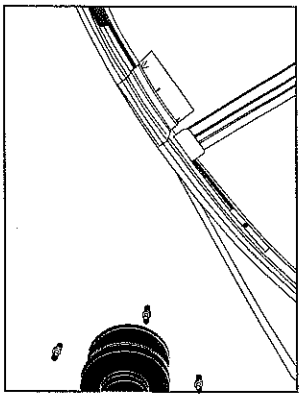


Fig. 105 — Belt Attached to Wheel Rim

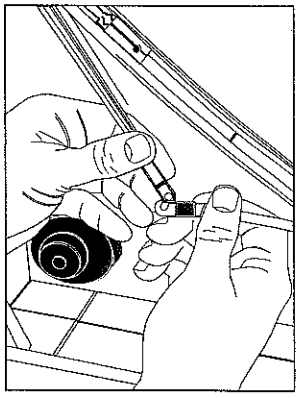


Fig. 106 — Belts Linked Together

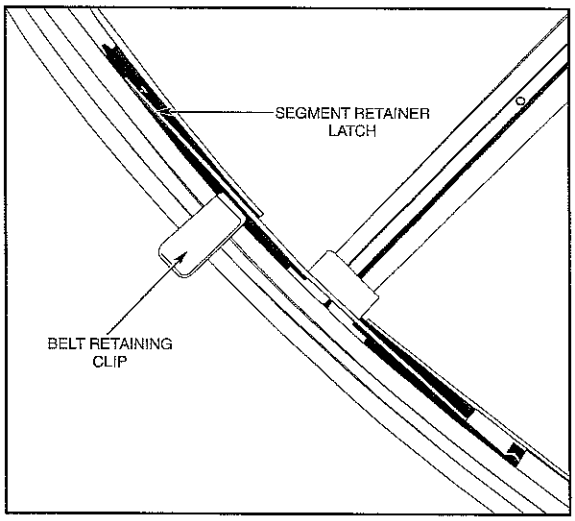


Fig. 107 — Detail of Belt Retaining Clip and Segment Retained Latch

AIR-DRYING METHOD OF COIL PROTECTION (Unit and coil must be level for this method.)

1. Close coil water supply and return main valves.
2. Drain coil as described in procedures for Antifreeze Methods of Coil Protection, preceding.
3. Connect air supply or air blower to inlet header connection and close its drain connection.
4. Circulate air and check for air-dryness by holding mirror in front of open vent in outlet header drain connection. Mirror will fog if water is still present.
5. Allow coil to stand for a few minutes; repeat Step 4 until coil is dry.

Coil Removal

NOTE: To reinstall coils, refer to Coil Installation section on page 61.

REMOVAL OF SINGLE HEIGHT COILS (sizes 03-36) — The coils in horizontal coil sections may be removed from the top of the unit or either end. Once the external panels are removed from the unit, the horizontal upper coil section frame members are easily removable from the framework, to allow hoisting the coil up and out of the unit.

NOTE: Refer to Table 13 (Dry Coil Weights) in the front of this manual before attempting to remove a coil from the unit.

1. Lock open and tag all power supplies to unit fan motor and electric heaters if present.
2. Remove service panel/coil connection panel and the upstream service panel and set aside in a safe place.
3. a. On horizontal coil sections without another unit section stacked on top, remove the flat corner plug from each end piece of the top rail.
   b. Extract the Torx T25 screw visible within the exposed cavity. (Do not mix these screws with others; they are specific for this location. Set screws aside for reinstallation of top rail.)
   c. Remove the top rail by pulling out at a 45-degree angle. Set top rail aside.

IMPORTANT: Properly support the coil to assure its stability before continuing with this procedure.

4. Remove the fastening screws from the upstream perimeter face of the coil that attach the coil to the coil baffles. This may require reaching through an opened damper assembly, reaching through a filter track after filters are removed, or removing a coil immediately upstream.

⚠ CAUTION

Do not handle the coil by the headers or connection nipples, as irreparable damage might occur that is NOT covered by warranty. Protect the finned surface from damage during all handling and shipping.

5. Slip the foam sealing sleeves off the connection nipples before removing the coil and set the sleeves aside.
6. The coil may now be hoisted out through the top opening or carefully slid out either side of the cabinet. Sections where the top frame rail cannot be removed may require slightly tipping of the coil from the vertical position, to clear the upper frame rail and seal.

REMOVAL OF STACKED COILS (sizes 40, 50 and 61) — The coils in horizontal coil sections may be removed from the top of the unit or either end. Once the external panels are removed from the unit, the horizontal upper coil section frame members are easily removable from the framework, to allow hoisting the coil up and out of the unit.

1. Lock open, and tag all power supplies to unit fan motor and electric heaters if present.
2. a. Remove service panel/coil connection panel and the upstream service panel and set aside in a safe place.
   b. Remove the top rail by pulling out at a 45-degree angle. Set top rail aside.
3. a. On horizontal coil sections without another unit section stacked on top, remove the flat corner plug from each end piece of the top rail.
   b. Extract the Torx T25 screw visible within the exposed cavity. (Do not mix these screws with others; they are specific for this location. Set screws aside for reinstallation of top rail.)
   c. Remove the top rail by pulling out at a 45-degree angle. Set top rail aside.

IMPORTANT: Properly support the coil to assure its stability before continuing with this procedure.

4. Remove the fastening screws of the uppermost coil from the upstream side. Note that the fastening screws pass through the vertical angle, baffles, and coil casing. See Fig. 110. Removal of the fastening screws may require reaching through an opened damper assembly, reaching through a filter track after filters are removed, or removing a coil immediately upstream.

⚠ CAUTION

Do not handle the coil by the headers or connection nipples, as irreparable damage might occur that is NOT covered by warranty. Protect the finned surface from damage during all handling and shipping.

5. Slip the foam sealing sleeves off the connection nipples before removing the coil and set the sleeves aside.
6. The upper coil may now be hoisted out through the top opening, or carefully slid out either side of the cabinet. Sections where the top frame rail cannot be removed may require slightly tipping of the coil from the vertical position, to clear the upper frame rail and seal.
7. On the upstream side of the stacked coils, remove and set aside the center baffle spanning the two coils (see Fig. 110).
8. For sections that do not have a drain pan (heating only sections), remove the three hat channel spacer supports fastened to the top of the lower coil, and set aside.
9. For sections that do have a drain pan, remove the two hat channel spacer supports from the bottom of the coil section and set aside.
10. Remove the intermediate condensate drain pan.
11. Remove the spacer (hat channel) secured to the top center of the lower coil casing (see Fig. 111) and set aside.

Hot or cold areas of the coil face (or otherwise broad temperature differences and stratification) are usually indications that one or more circuits are air-locked internally. This can result in coil freeze-up (a condition NOT covered by warranty).

Refrigerant coils may be rotated for opposite hand applications, maintaining the proper airflow direction.

Do not reposition the distributor(s), they will perform equally well in upflow or downflow positions. When soldering expansion valves to up-feed distributors, use the minimum satisfactory amount of solder to prevent damaging the valve or plugging passages.

DIRECT EXPANSION COILS — Rotate the coil in vertical plane and reinstall. Distributor must be on downstream side of coil. (Refer to Fig. 112.)

CHILLED WATER AND HOT WATER COILS — These coils can be rotated. If coil is rotated in vertical plane and reinstalled with counterflow maintained, supply will be at the top of the coil and return will be at the bottom. Ensure coil is continuously vented and water velocity is maintained to prevent air binding.

⚠ CAUTION

Chilled and hot water coils must not be rotated horizontally. If coils are rotated horizontally, severe water blow-off will result.

STEAM INNER DISTRIBUTING TUBE COILS — Rotate in horizontal plane and reinstall. See Fig. 112.

PIPING — Direct expansion, chilled water, and hot water coils should always be piped for counterflow. (Fluid should enter the coil at the leaving-air side.) Steam coils must have the condensate connection at bottom of coil.

To determine intervals for cleaning coils in contaminated air operations, pressure taps should be installed across the coils and checked periodically. Abnormal air pressure drop will indicate a need for cleaning the coils.

Annual maintenance should include:

1. Clean the line strainers.
2. Blow down the dirt leg.
3. Clean and check operation of steam traps.
4. Check operation of control valves.
5. Check the operation of check valves to prevent condensate flowback.

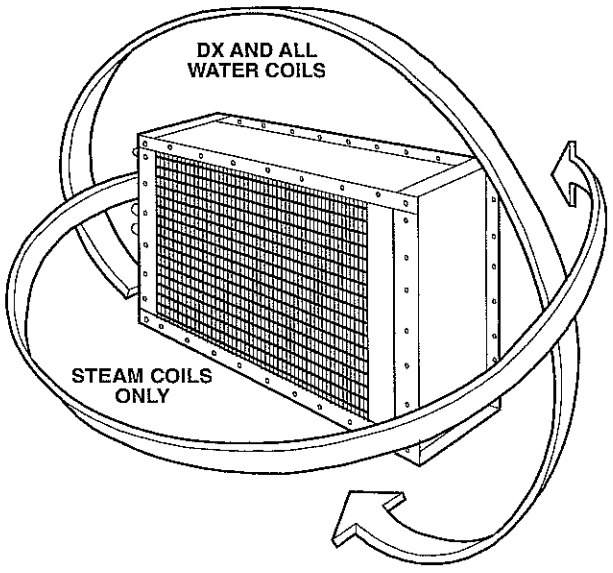


Fig. 112 — Coil Rotation

6. Check operation of thermostatic air vents, if used. A float and thermostatic trap will contain a thermostatic air vent. When the bellows is ruptured, it will fail closed.
7. Check operation of vacuum breakers.
8. Check operation of the thermal protection devices used for freeze-up protection.
9. Steam or condensate should not be allowed to remain in the coil during the off season.This will prevent the formation and build up of acids.

There are additional precautions and control strategies, as found in various catalogues and in the ASHRAE Fundamentals Handbook and in the Carrier System Design Guide — Piping Section, when the entering-air temperature to the coil falls below 35 F. These conditions occur when IDT coils are used for pre-heat and/or face and bypass applications.

Freeze up protection:

1. Use a strainer in the supply line and the dirt leg ahead of the trap.
2. Use a vacuum breaker in the return.
3. Do not use overhead returns from the coil. A floodback can occur.
4. An immersion thermostat to control outdoor-air dampers and the fan motor is recommended. This control is activated when the steam supply fails or the condensate temperature drops below a predetermined temperature, usually 120 F.
5. On low pressure and vacuum systems, the immersion thermostat may be replaced by a condensate drain with a thermal element. This element opens and drains the coil when the condensate temperature drops below 165 F. Note the thermal condensate drain is limited to 5 psig pressure. At greater coil pressures they will not open.

In spite of the precautions listed above, a coil may still freeze up. An oversize capacity coil, at partial load, with a modulating steam control valve will occasionally freeze. Freezing occurs in the 20 F to 35 F range of entering-air temperatures. A better installation would be an undersize coil, with an on/off control valve with thermostatic control in the outside air, set at 35 F air temperature, installed downstream of the first coil; or setting the minimum steam pressure at 5 psig.

Filters — See Table 29 for filter data for flat filter section, angle filter section, bag-cartridge filter section, and filter mixing box section. Filters are field supplied.

Air filters should be inspected regularly and changed when dirty. Filter life can vary greatly from one unit to another, depending upon the application and the amount of contaminants in the return and ventilation air entering the air handler. Each job should be evaluated and maintenance schedules established accordingly. At a minimum, the filters should be changed at the beginning of the cooling and heating seasons.

Although not a direct part of the air handler, outdoor air inlet screens and/or grilles that may be present should also be checked regularly and cleaned as necessary. They can easily become plugged with debris, grease, or other contaminants, depending upon their location. This reduces the availability of ventilation air, which can contribute to indoor air quality problems.

All filter sections use adjustable blank-off plates to close off any airway area not filled with filter media. Check blank-off plates to prevent unfiltered air from bypassing the filters. Blank-off plates must be on door side of unit.

BAG-CARTRIDGE FILTERS — Side loading bag-cartridge filter section can use either bag or rigid filters, 6-in. to 30-in. deep, with $^{7}/_{8}$-in. header. They *will not* accept headerless rigid filters.

Face loading bag-cartridge filter sections can use either bag or rigid filters and are loaded from the front of the section. These sections use Purolator holding frames located at the downstream edge of the filter section for prefilters and bag/cartridge filters. Cartridge filters without headers can extend upstream of the holding frame by 24 inches. Cartridge and bag filters with $^{7}/_{8}$-in. header extend downstream of the filter section with filter length limited only by the length of the plenum following the filter section. Filter elements are retained in frames by wire fastener clips. To replace filter elements, remove clips, insert elements with bag or cartridge downstream and reinstall clips. See Fig. 113.

See Fig. 114 for typical track for bag-cartridge filter section used on draw-thru unit.

IN-TRACK BAFFLES — Filter sections are shipped with adjustable in-track baffles. When installed properly as shown in Fig. 115, the baffles close off empty space in the track preventing air from bypassing the filters. Remove the baffles to install filter elements, and replace the adjustable baffles after the filters are in place. The adjustable baffles should be spread far enough apart to ensure slight compression in the foam gasket when closing the section door.

FLAT AND ANGLE FILTERS — Flat filter and angle filter sections accommodate 2-in. or 4-in. thick filters. The section as shipped accepts 2-in. filters. Remove angle spacer in each track to provide the space required to accommodate 4-in. filters.

HEPA FILTERS — The Puro-Frame, HEPA holding frame will accommodate 12-in. deep filters. HEPA filter sections used in blow-thru applications are loaded from the front, through the access door or removable panel. The HEPA filters are retained in the frame with retaining brackets. RTV sealant should be used to seal between the filter frame and the filter media's neoprene gasket to ensure a leaktight installation. Refer to Fig. 116 for details. Downstream edge of frame to frame and frame to baffle shall be sealed with RTV sealant.

Filter arrangements are shown in Fig. 117-121.

Magnehelic Gage Maintenance — No lubrication or periodic servicing is required. Keep case exterior and cover clean. Occasionally disconnect pressure lines to vent both sides of gage to atmosphere and re-zero.

CALIBRATION CHECK — Select a second gage or manometer of known accuracy and in an appropriate range. Using short lengths of rubber or vinyl tubing, connect the high pressure side of the Magnehelic gage and the test gage to two legs of a tee. Very slowly apply pressure through the third leg. Allow a few seconds for pressure to equalize, fluid to drain, etc., and compare readings. If accuracy is unacceptable, the gage may be returned to factory for recalibration. For best results, return gage to the factory. Ship prepaid to:
Dwyer Instruments, Inc.
Attn: Repair Dept.
102 Indiana Highway 212
Michigan City, IN 46360

To calibrate in the field, use the following procedure:

⚠ CAUTION

If bezel binds when installing, lubricate threads sparingly with light oil or molybdenum disulphide compound.

⚠ CAUTION

Attempted field repair may void your warranty. Recalibration or repair by the user is not recommended.

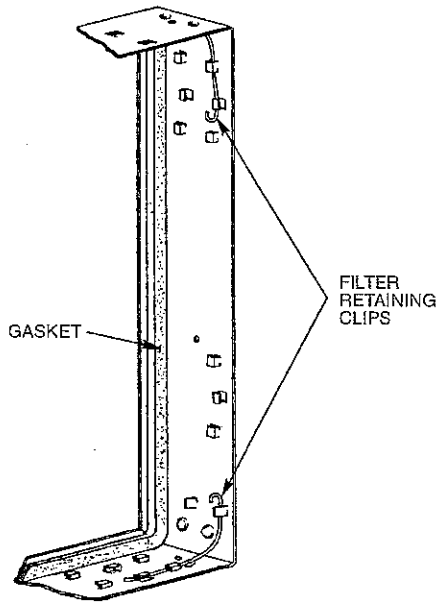


Fig. 113 — Puro-Frame Holding Frame and Filter Retaining Clips

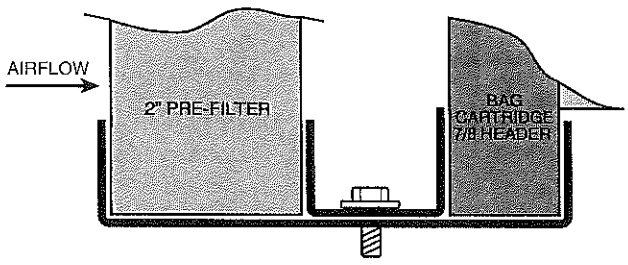


Fig. 114 — Track for Draw-Thru Bag Cartridge Filter Section

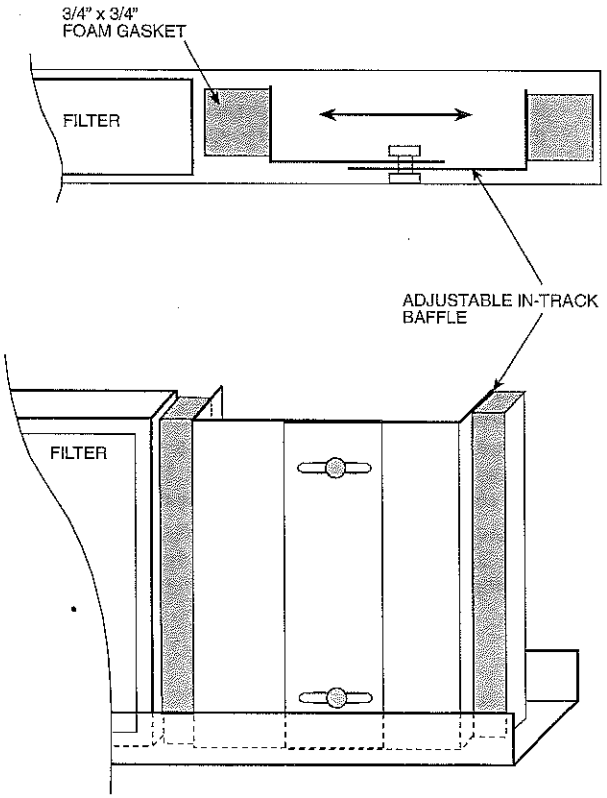
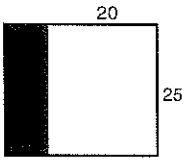
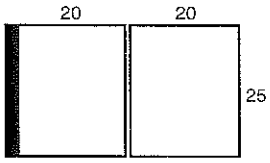


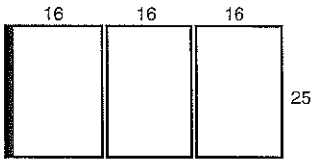
Fig. 115 — In-Track Baffle for Flat, Angle and Sideloading Bag/Cartridge Filter Sections



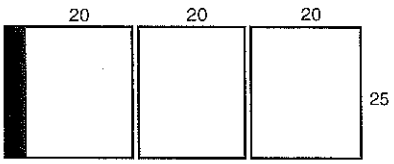
Unit Size 03
Flat Filter Section
(1) 25 x 20



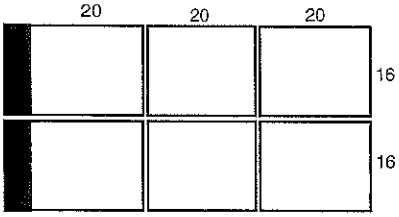
Unit Size 06
Flat Filter Section
(2) 25 x 20



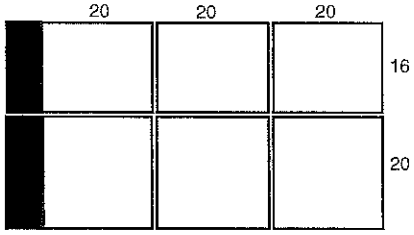
Unit Size 08
Flat Filter Section
(3) 25 x 16



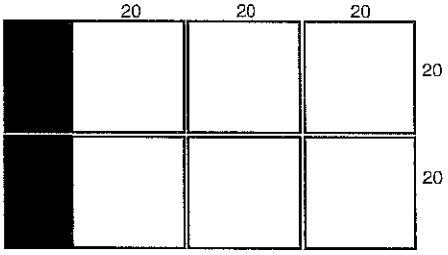
Unit Size 10
Flat Filter Section
(3) 25 x 20



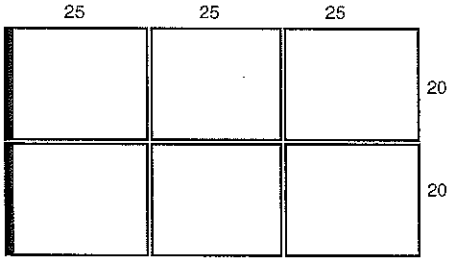
Unit Size 12
Flat Filter Section
(6) 16 x 20



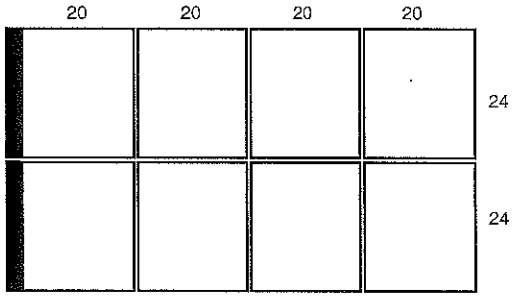
Unit Size 14
Flat Filter Section
(3) 16 x 20, (3) 20 x 20



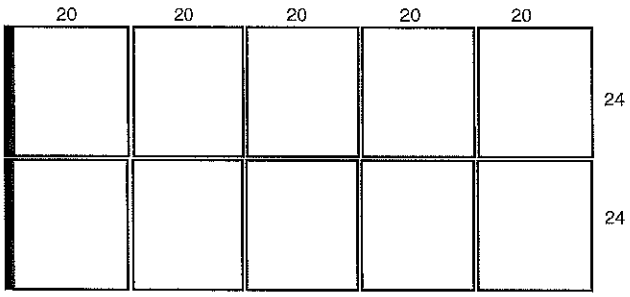
Unit Size 17
Flat Filter Section
(6) 20 x 20



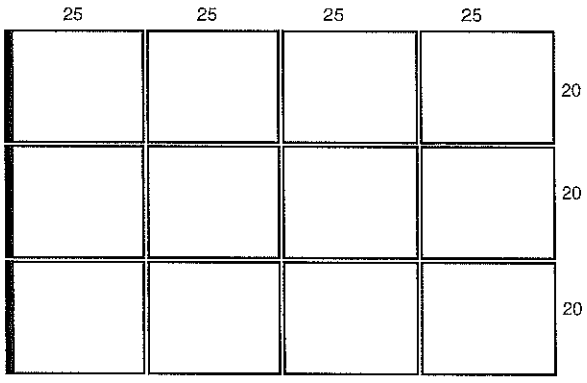
Unit Size 21
Flat Filter Section
(6) 20 x 25



Unit Size 25
Flat Filter Section
(8) 24 x 20



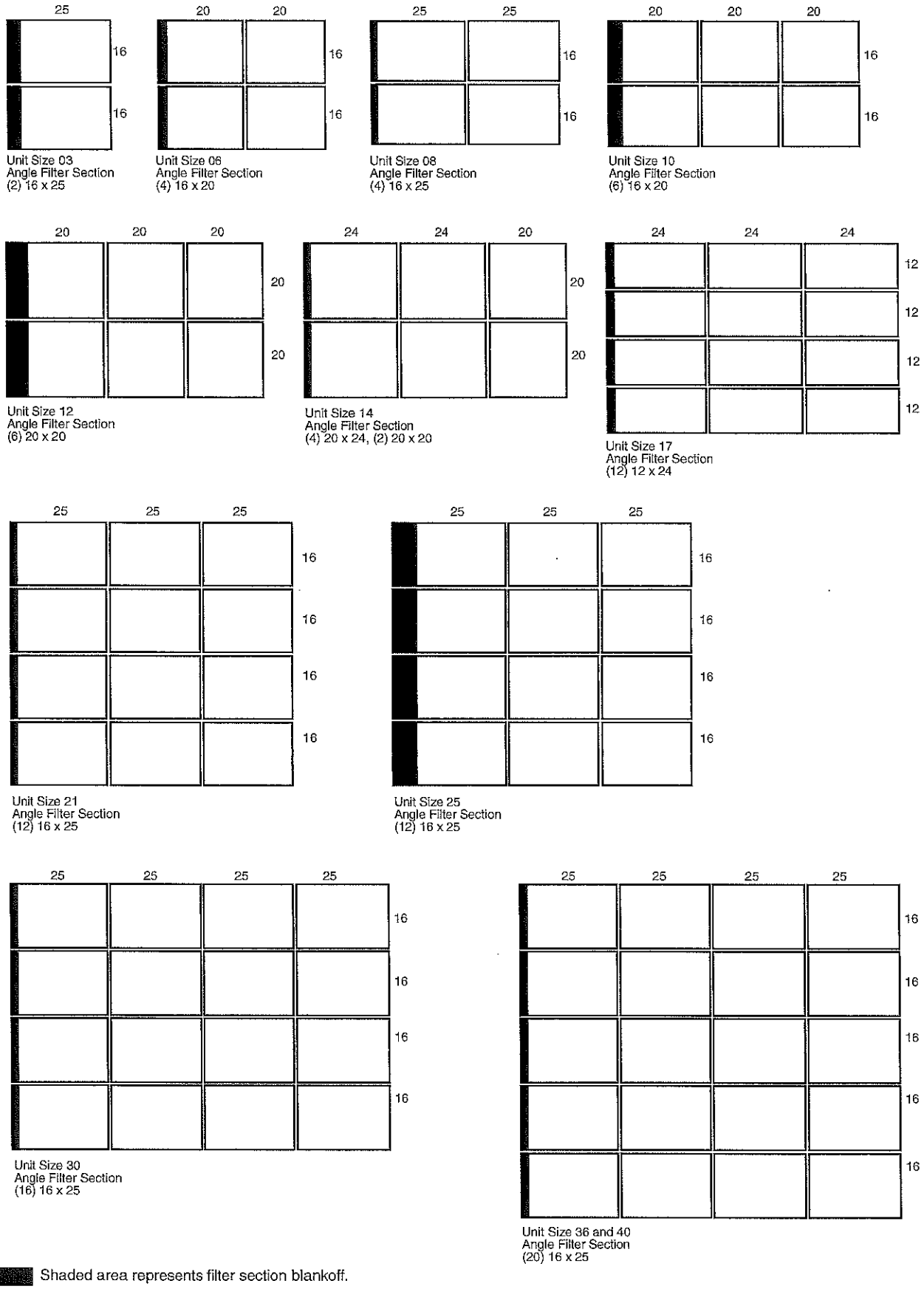
Unit Size 30
Flat Filter Section
(10) 24 x 20



Unit Size 36
Flat Filter Section
(12) 20 x 25

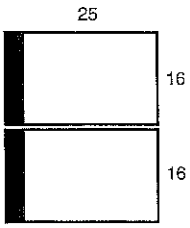
Shaded area represents filter section blankoff.

Fig. 117 — Flat Filter Arrangement — 2-in. or 4-in.

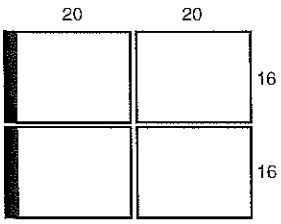


Shaded area represents filter section blankoff.

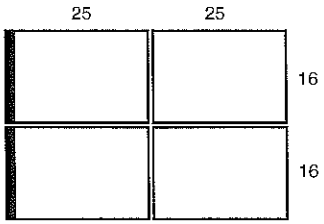
Fig. 118 — Angle Filter Arrangement — 2-in. or 4-in.



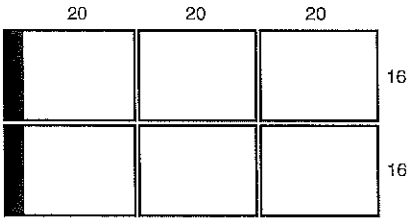
Unit Size 03
Filter Mixing Box Section
(2) 16 x 25



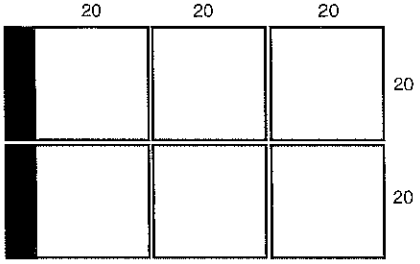
Unit Size 06
Filter Mixing Box Section
(4) 16 x 20



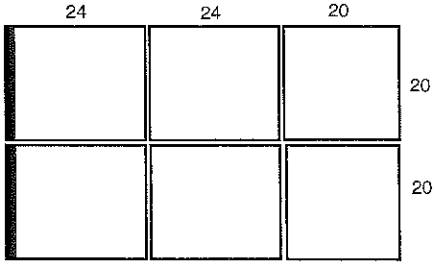
Unit Size 08
Filter Mixing Box Section
(4) 16 x 25



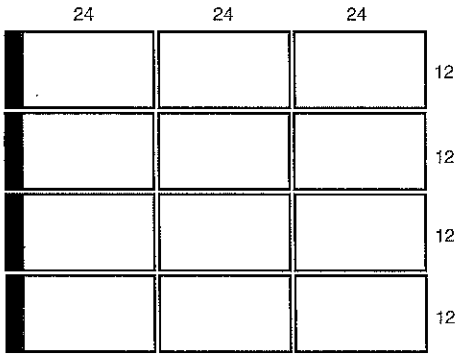
Unit Size 10
Filter Mixing Box Section
(6) 16 x 20



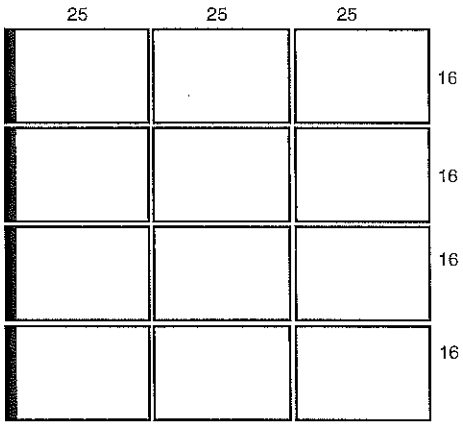
Unit Size 12
Filter Mixing Box Section
(6) 20 x 20



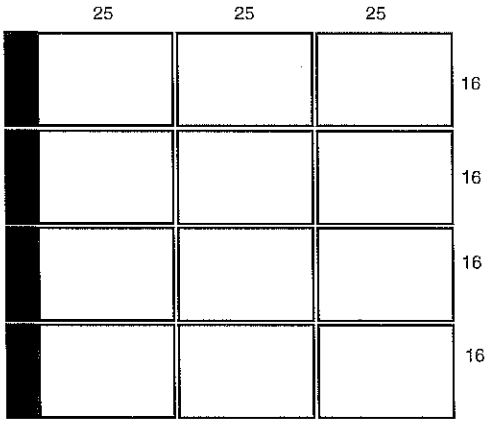
Unit Size 14
Filter Mixing Box Section
(4) 20 x 24, (2) 20 x 20



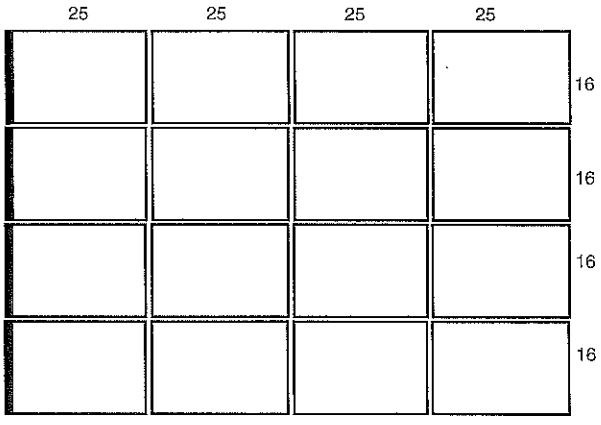
Unit Size 17
Filter Mixing Box Section
(12) 12 x 24



Unit Size 21
Filter Mixing Box Section
(12) 16 x 25



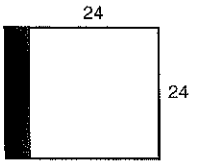
Unit Size 25
Filter Mixing Box Section
(12) 16 x 25



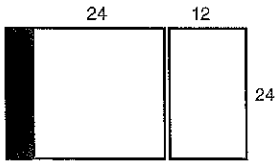
Unit Size 30
Filter Mixing Box Section
(16) 16 x 25

Shaded area represents filter section blankoff.

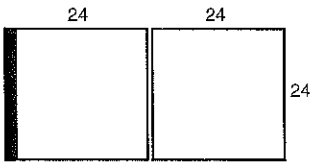
Fig. 119 — Filter Mixing Box Arrangement — 2-in. or 4-in.



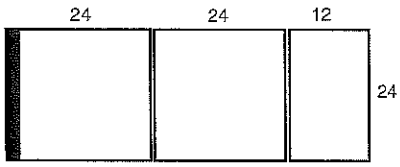
Unit Size 03
Bag/Cartridge
Pre-filter Section
(1) 24 x 24



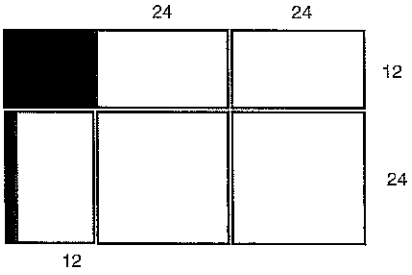
Unit Size 06
Bag/Cartridge
Pre-filter Section
(1) 24 x 24, (1) 24 x 12



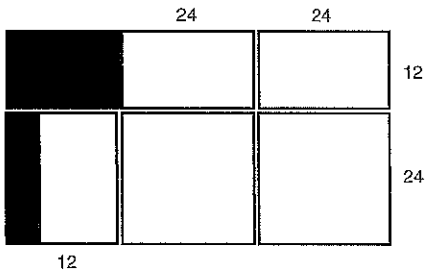
Unit Size 08
Bag/Cartridge
Pre-filter Section
(2) 24 x 24



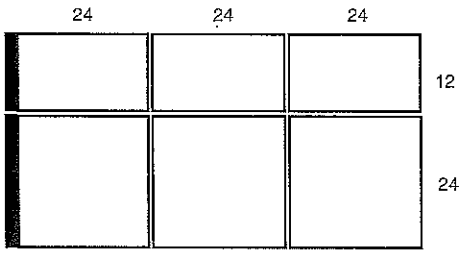
Unit Size 10
Bag/Cartridge
Pre-filter Section
(2) 24 x 24, (1) 24 x 12



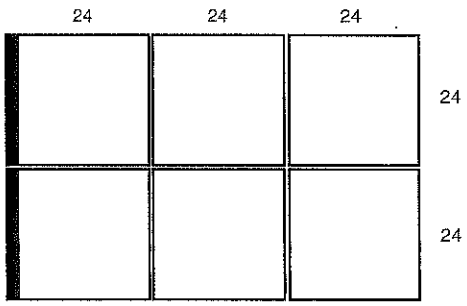
Unit Size 12
Bag/Cartridge
Pre-filter Section
(3) 12 x 24, (2) 24 x 24



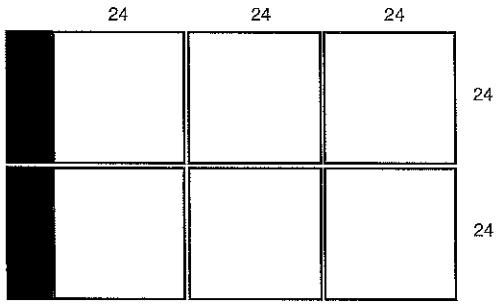
Unit Size 14
Bag/Cartridge
Pre-filter Section
(3) 12 x 24, (2) 24 x 24



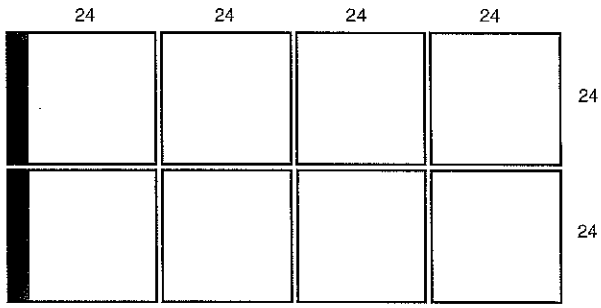
Unit Size 17
Bag/Cartridge
Pre-filter Section
(3) 12 x 24, (3) 24 x 24



Unit Size 21
Bag/Cartridge
Pre-filter Section
(6) 24 x 24



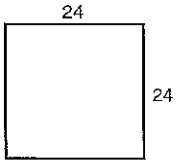
Unit Size 25
Bag/Cartridge
Pre-filter Section
(6) 24 x 24



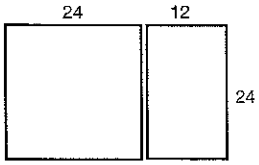
Unit Size 30
Bag/Cartridge
Pre-filter Section
(8) 24 x 24

Shaded area represents filter section blankoff.

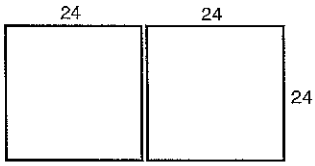
Fig. 120 — Side Load Bag/Cartridge Filter Arrangement



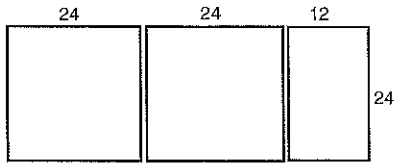
Unit Size 03
Bag/Cartridge/HEPA
Pre-filter Section
(1) 24 x 24



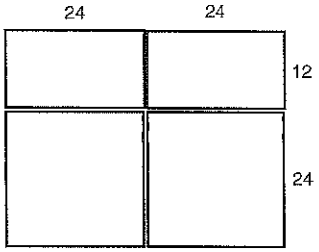
Unit Size 06
Bag/Cartridge/HEPA
Pre-filter Section
(1) 24 x 24, (1) 24 x 12



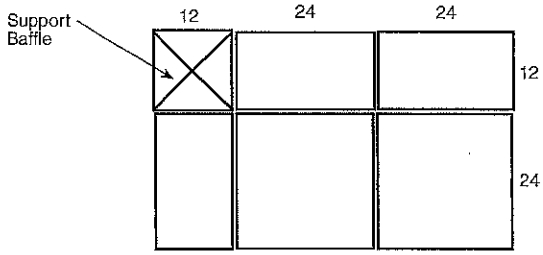
Unit Size 08
Bag/Cartridge/HEPA
Pre-filter Section
(2) 24 x 24



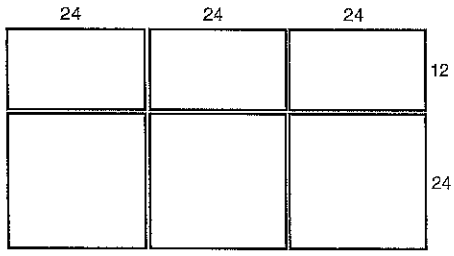
Unit Size 10
Bag/Cartridge/HEPA
Pre-filter Section
(2) 24 x 24, (1) 24 x 12



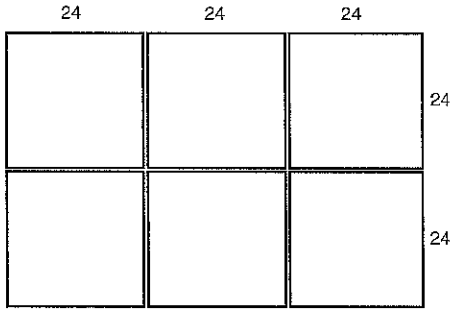
Unit Size 12
Bag/Cartridge/HEPA
Pre-filter Section
(2) 12 x 24, (2) 24 x 24



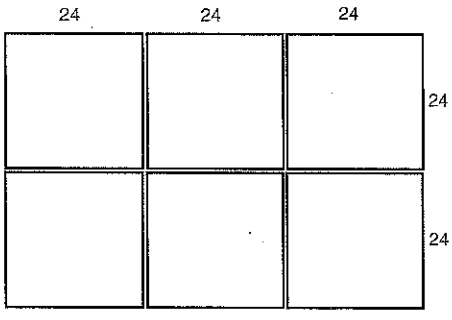
Unit Size 14
Bag/Cartridge/HEPA
Pre-filter Section
(3) 12 x 24, (2) 24 x 24



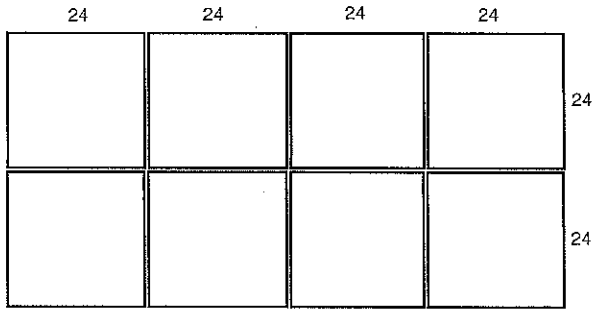
Unit Size 17
Bag/Cartridge/HEPA
Pre-filter Section
(3) 12 x 24, (3) 24 x 24



Unit Size 21
Bag/Cartridge/HEPA
Pre-filter Section
(6) 24 x 24



Unit Size 25
Bag/Cartridge/HEPA
Pre-filter Section
(6) 24 x 24



Unit Size 30
Bag/Cartridge/HEPA
Pre-filter Section
(8) 24 x 24

Fig. 121 — Face Load Bag/Cartridge/HEPA Filter Arrangement

Fan and Shaft Removal — On airfoil fans, the fan wheel and shaft may be removed through inlet side of fan housing. See Fig. 122. On plenum fans, remove side, top, or end panel opposite inlet, wherever ductwork is not connected. After removing panel, proceed as follows.

1. Remove drive belts as described in Fan Shaft Bearing Removal section.
2. Block up fan wheel within housing to prevent dropping when bearing bolts are removed.
3. Loosen bearing holddown bolts, block shaft up.
4. Loosen bearing setscrews and locking collar, and remove holddown bolts. On forward-curved fans, remove cutoff plate. Remove fan wheel through discharge opening.

NOTE: To facilitate easy removal of setscrew fastened wheels, sheaves or bearings, remove the setscrew completely. Taking care not to damage threads, insert a flat ended drift or punch, tap lightly and carefully return the material displaced on the shaft by the setscrew to its original place.

5. Remove bearing support channels and inlet ring from one side.
6. Remove fan shaft and fan wheel from unit.
7. Remove fan shaft from fan wheel.
8. Replace shaft and wheel into fan in the reverse order of their removal.
9. Inspect bearings and if serviceable, replace on shaft.
10. For airfoil and forward-curved fans, align fan wheel and shaft assembly in fan scroll. Check cutoff location if wheel failure damaged cutoff plate. For plenum fan, align wheel and shaft assembly per manufacturer's directions supplied with fan.
11. Tighten bearing holddown bolts, bearing setscrews, and shaft setscrews.
12. Field balancing of shaft and wheel is recommended.

IMPORTANT: Replacement shafts must have a diameter tolerance at bearing mount of +.0000 in./-.001 in. nominal. Carrier specified parts are recommended.

Motor Location — The motor and motor base must be moved to place the motor at the front or rear of unit. The proper location is the one that results in the longest drive centerline distance. The motor may need to be replaced since the conduit box may need to be reversed: The conduit box (if not on top) should always be under the fan shaft for maximum centerline distance and motor adjustment.

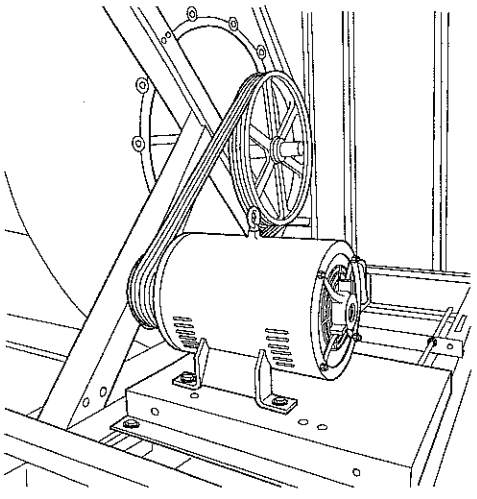


Fig. 122 — Fan Shaft and Bearing Removal

INTERNALLY ISOLATED UNIT — When fan discharge is altered the motor is moved, then all isolators must be readjusted to assure proper unit isolation.

Rebalancing of the unit is recommended.

Lubrication

MOTORS — Lubricate in accordance with nameplate attached to motor or with manufacturer's recommendations.

BEARINGS

Initial Fan Bearing Lubrication — Most bearings are greased when they are manufactured and will not require additional grease on start-up (verify specific manufacturer's recommendations). Some seepage of grease from the seals is normal during the initial run-in period. For safety purposes, lock out and tag equipment and wipe up any external grease from the bearings.

Monitor bearings after they have been run for several minutes. Check bearings for excessive noise, vibration, and temperature. Typical operating bearing temperature range should be 100 to 150 F. The initial temperature may be higher than the expected steady state temperature.

Bearing Lubrication Instructions — Lithium or lithium complex base grease, conforming to NLGI (National Lubricating Grease Institute) grade 2 consistency, and an oil viscosity of 455-1135 SUS (Saybolt Universal Seconds) at 100 F 100-250 cSt [centistokes] at 40 C) may be used for relubrication.

Examples: Mobil Mobilith AW2
Mobil Mobilux #2
Shell Alvania #2
Texaco Multifak #2
Texaco Premium RB
Exxon Unirex N2
Amoco Amolith 2

Compatibility of grease is critical; consult with the grease manufacturer and/or supplier for current grease specifications to ensure compatibility.

To lube bearings, a grease gun should be equipped with a two-pound relief valve so that the pressure to the bearings does not exceed the level that the seals can handle. If the bearing seals are ruptured, lubricant will escape prematurely and the bearing will fail.

Always wipe the fitting and grease nozzle clean to avoid introducing contamination into the bearing.

For safety, lock out and tag equipment and restrain rotating components. Add one half the recommended amount shown in Table 30. Start bearing, and run for a few minutes. Stop bearing and add the second half of the recommended amount. A temperature rise after lubrication of approximately 30°F is normal. Bearings should operate at temperatures less than 200 F and should not exceed 225 F for intermittent operation. For a lubrication schedule see Table 31.

NOTE: The tables below state general lubrication recommendations based on experience and are intended as suggested or starting points only. For best results, specific applications should be monitored regularly and lubrication intervals and amounts adjusted accordingly.

Table 30 — Recommended Relubrication Grease Charge

SHAFT SIZE (in.)	GREASE CHARGE (oz)
1/2 to 3/4	0.03
7/8 to 1 3/16	0.1
1 1/4 to 1 1/2	0.15
1 11/16 to 1 15/16	0.2
2 to 2 7/16	0.3
2 1/2 to 2 15/16	0.5
3 to 3 7/16	0.85
3 1/2 to 4	1.5

CONTROL PANEL CLEANING — Use a soft damp cloth to clean the control panel. Avoid harsh cleaners which could scratch the display window.

BATTERY REPLACEMENT — A battery is only used in assistant control panels that have the clock function available and enabled. The battery keeps the clock operating in memory during power interruptions. The expected life for the battery is greater than ten years. To remove the battery, use a coin to rotate the battery holder on the back of the control panel. Replace the battery with type CR2032.

TROUBLESHOOTING

Steam Coil Performance Problems — Coil capacity is normally not a problem with steam coils. Low capacity can result from blocked or plugged air side surface, an air bound coil, or a coil which is filled with condensate because of a non-functioning steam trap. The Carrier steam coils with the 1-in. OD outer tube have at least twice the condensate loading capacity of a coil with $^5/_8$-in. OD outer tubes.

Water hammer can damage the coil and cause leaks. It is typically caused by improper piping of the steam supply, allowing condensate to enter the coil with the steam supply; or by accumulation of condensate in the coil which can occur with the coils operating at partial load without a vacuum breaking device.

Problems with temperature control can occur when a thermostatic controller or steam control valve is not functioning properly. Temperature control problems will also occur when the steam controls valve is oversized. Consider $^1/_3$ to $^2/_3$ valve arrangements for full range control.

Problems with "water logging" of the condensate tubes can occur when a coil with over 6-foot tubes is selected at high air velocities, low steam pressures (below 5 psig) and high density fin spacing (9 fins per inch or more). This high density fin spacing, while producing high levels of heating capacity, also promotes excessive condensate. Given the length of the tubes and the low steam supply pressure, condensate can build up faster than the drain system can carry it away. Considerations should be given for using two coils in series for this application.

Steam Failure Modes — The following failure modes could take as little as a weekend to damage a coil, or much longer.

Problems occur quickly in coils using low pressure steam (<3 psig). Water hammer can develop inside the coil at the header end because the steam has already condensed and the low steam pressure does not adequately clear it from the coil. This condensate re-boils and starts up water hammer inside the tubes. The action of this type of water hammer, which sounds like crackling inside the coil, is many tiny bubbles impinging on the inner and outer tubes. One result is the inner tube gets work hardened and eventually shatters. Another result is the eventual erosion of the outer tube causing pinhole leaks.

Coils which are not properly vented will eventually load up with noncondensable gases. Coil performance (temperature rise) drops off as the noncondensables act as insulation inside the tubes.

The coils may also fill with condensate. The collapsing steam causes a vacuum inside the coil when the supply valve closes. The trapped condensate will then freeze causing the tubes to rupture after it melts. The use of a vacuum breaker at the condensate discharge will aid in relieving the vacuum in the coil and promote condensate drainage.

Refer to Tables 33-35 for 39M troubleshooting information.

⚠ WARNING

Disconnect power and allow all rotating equipment to stop before servicing unit. Physically secure all fans before performing unit service. Failure to do so may result in serious personal injury or death.

Water coil performance (when piped in parallel flow), will be reduced by approximately 5% for each coil row on coils 2 rows deep and deeper. Coils should always be piped with the water inlet on the leaving air side of the coil, regardless of water connection vertical position.

VFD Diagnostics — The drive detects error situations and reports them using:

- the green and red LEDs on the body of the drive (located under the keypad)
- the status LED on the control panel
- the control panel display
- The Fault Word and Alarm Word parameters bits (parameters 0305 to 0309)

The form of the display depends on the severity of the error. The user can specify the severity for many errors by directing the drive to ignore the error situation, report the situation as an alarm, or report the situation as a fault.

FAULTS (RED LED LIT) — The VFD signals that it has detected a severe error, or fault, by:

- enabling the red LED on the drive (LED is either steady or flashing)
- setting an appropriate bit in a Fault Word parameter (0305 to 0307)
- overriding the control panel display with the display of a fault code
- stopping the motor (if it was on)
- sets an appropriate bit in Fault Word parameter 0305 to 0307

The fault code on the control panel display is temporary. Pressing the MENU, ENTER, UP button or DOWN buttons removes the fault message. The message reappears after a few seconds if the control panel is not touched and the fault is still active.

ALARMS (GREEN LED FLASHING) — For less severe errors, called alarms, the diagnostic display is advisory. For these situations, the drive is simply reporting that it had detected something unusual. In these situations, the drive:

- flashes the green LED on the drive (does not apply to alarms that arise from control panel operation errors)
- sets an appropriate bit in an Alarm Word parameters (0308 or 0309)
- overrides the control panel display with the display of an alarm code and/or name

Alarm messages disappear from the control panel display after a few seconds. The message returns periodically as long as the alarm condition exists.

Table 34 — Humidifier Troubleshooting (cont)

SYMPTOM	CAUSE	REMEDY
Steam Valve will not Close	There is no control signal.	Verify and, if necessary, correct control signal to the valve actuator.
	Control polarity has been reversed.	Verify and, if necessary, correct control signal polarity to the valve actuator.
	Actuator is not working.	Remove actuator to verify that it is operational. Clean or replace jammed valve.
	There is high steam pressure.	Verify that the steam pressure has not changed. Excessively high pressure could jam the valve.
	Valve has been installed incorrectly.	Verify proper valve orientation. Electric valves must face upward.
Steam Valve is Leaking	Control signal is not at full range.	Verify and, if necessary, correct full-range control signal to the valve actuator.
	Control polarity has been reversed.	Verify and, if necessary, correct control signal polarity to the valve actuator.
	Actuator is not working.	Remove actuator and test to verify that it is operational. If not, clean or replace jammed valve.
	There is high steam pressure.	Verify that the steam pressure has not changed. Excessively high pressure could jam the valve.
Humidity Exceeds Set Point	Control signal is not at full range.	Verify and, if necessary, correct compatibility of the full range control signal to the valve actuator.
	There is no control signal.	Verify and, if necessary, correct control signal polarity to the valve actuator.
	The controller is out of calibration.	Check and, if necessary, correct calibration of controller.
	Humidity sensor is not installed properly.	Ensure that humidity sensors are installed correctly and not located in drafts (wall). If necessary, correct sensor installation.
	Actuator is not working.	Remove actuator and test to verify that it is operational. If not, clean or replace jammed valve.
	There is high steam pressure.	Verify that the steam pressure has not changed. Excessively high pressure could jam the valve.
	Boiler is not operating correctly.	Verify stable boiler pressure. Wide swings in pressure could affect the humidity controls.
Humidity Remains Below Set Point	Control signal is not at full range.	Verify and, if necessary, correct compatibility of the full range control signal to the valve actuator.
	Control polarity has been reversed.	Verify and, if necessary, correct control signal polarity to the valve actuator.
	Controller is out of calibration.	Check and, if necessary, correct calibration of controller.
	Humidity sensor is not installed properly.	Ensure that humidity sensors are installed correctly and not located in drafts (wall). If necessary, correct sensor installation.
	Actuator is not working.	Remove actuator and test to verify that it is operational. If not, clean or replace jammed valve.
	There is high steam pressure.	Verify that the steam pressure has not changed. Excessively high pressure could jam the valve.
	Boiler is not operating correctly.	Verify stable boiler pressure. Wide swings in pressure could affect the humidity controls.
	There is an airflow switch fault.	Ensure that airflow switch is not fluttering. If necessary, correct fluttering airflow switch.
	The high limit controller is not in the correct location.	Verify that high-limit controller is not located too close to steam discharge manifolds. If necessary, correct location of controller.
	The humidifier is too small.	Humidifier is undersized. Check humidity load calculations.
Condensate in unit	The humidifier is too large.	Verify humidifier capacity versus air volume.
	There is a high limit controller fault.	Verify that high limit controller is working. If necessary, correct problem.
	Evaporation distance is too short.	Verify and, if necessary, correct evaporation distance to obstructions or elbows.
	Steam valve is leaking.	Verify steam valve is not leaking. If necessary, correct leaking steam valve.
Steam leaks from P-traps	The trap height is incorrect.	Ensure that height of trap exceeds the static pressure of the duct/AHU, especially if under negative pressure.
	Valve sizing is incorrect.	Check valve sizing to maximum manifold capacity. If necessary, resize valve within manifold capacity.
	There is excessively high steam pressure.	Check that inlet steam pressure does not exceed humidifier capability.

*May be serial number specific.

AHU — Air-Handling Unit

Table 35 — Troubleshooting

SYMPTOM	CAUSE	REMEDY
Motor Fails to Start	Power line open	Reset circuit breaker.
	Improper wiring or loose connections	Check wiring and connections.
	Overload trip	Check and reset overload.
	Mechanical failure	Inspect motor and drive for operation and/or damage.
	Improper current supply	Check rating plate against actual supply voltage. Contact power provider for adjustments if needed.
Motor Stalls	Open Phase	Check line for open phase.
	Overloaded motor	Reduce motor load or replace with larger motor.
	Low line voltage	Check supply line, correct voltage.
Excessive Vibration	Bearing/shaft misalignment	Check and align bearing set screws.
	Shipping blocks/spacers not removed	Remove shipping blocks/spacers.
	Excessive belt tension	Adjust belt tension.
	Drive misaligned	Align drive.
Bearing(s) is Hot	Grease not evenly distributed after lubrication	Allow unit to cool down and restart.
	Over-lubrication	Clean and purge excess grease.
	No lubricant	Check bearings for damage and apply lubricant.
	Misaligned bearing	Check shaft level and reset alignment.
Motor Does Not Run at Full Speed	Low voltage at motor terminals	Check supply voltage and correct voltage loss.
	Supply wiring to motor too small	Rewire with properly sized wire.
Motor Overheats	Overloaded motor	Reduce motor load or replace with larger motor.
	Motor fan is clogged, preventing motor cooling	Clean motor fan.
Excessive Motor Noise	Mounting bolts loose	Tighten bolts.
	Rigid coupling connectors	Replace with flexible connectors.
	Worn motor bearings	Replace bearings and seals.
	Fan rubbing on housing	Adjust housing.

Table 36 — Fault Codes

FAULT CODE	FAULT NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
1	OVERCURRENT	Output current is excessive. Check for excessive motor load, insufficient acceleration time (parameters 2202 ACCELER TIME 1, default 30 seconds), or faulty motor, motor cables or connections.
2	DC OVERVOLT	Intermediate circuit DC voltage is excessive. Check for static or transient over voltages in the input power supply, insufficient deceleration time (parameters 2203 DECELER TIME 1, default 30 seconds), or undersized brake chopper (if present).
3	DEV OVERTEMP	Drive heat sink is overheated. Temperature is at or above 115 C (239 F). Check for fan failure, obstructions in the airflow, dirt or dust coating on the heat sink, excessive ambient temperature, or excessive motor load.
4	SHORT CIRC	Fault current. Check for short-circuit in the motor cable(s) or motor or supply disturbances.
5	OVERLOAD	Inverter overload condition. The drive output current exceeds the ratings.
6	DC UNDERVOLT	Intermediate circuit DC voltage is not sufficient. Check for missing phase in the input power supply, blown fuse, or under voltage on main circuit.
7	AI1 LOSS	Analog input 1 loss. Analog input value is less than AI1 FLT LIMIT (3021). Check source and connection for analog input and parameter settings for AI1 FLT LIMIT (3021) and 3001 AI<MIN FUNCTION.
8	AI2 LOSS	Analog input 2 loss. Analog input value is less than AI2 FLT LIMIT (3022). Check source and connection for analog input and parameter settings for AI2 FLT LIMIT (3022) and 3001 AI<MIN FUNCTION.
9	MOT OVERTEMP	Motor is too hot, as estimated by the drive. Check for overloaded motor. Adjust the parameters used for the estimate (3005 through 3009). Check the temperature sensors and Group 35 parameters.
10	PANEL LOSS	Panel communication is lost and either drive is in local control mode (the control panel displays LOC), or drive is in remote control mode (REM) and is parameterized to accept start/stop, direction or reference from the control panel. To correct, check the communication lines and connections. Check parameter 3002 PANEL COMM ERROR, parameters in Group 10: Command Inputs and Group 11: Reference Select (if drive operation is REM).
11	ID RUN FAIL	The motor ID run was not completed successfully. Check motor connections.
12	MOTOR STALL	Motor or process stall. Motor is operating in the stall region. Check for excessive load or insufficient motor power. Check parameters 3010 through 3012.
13	RESERVED	Not used.
14	EXT FAULT 1	Digital input defined to report first external fault is active. See parameter 3003 EXTERNAL FAULT 1.
15	EXT FAULT 2	Digital input defined to report second external fault is active. See parameter 3004 EXTERNAL FAULT 1.
16	EARTH FAULT	The load on the input power system is out of balance. Check for faults in the motor or motor cable. Verify that motor cable does not exceed maximum specified length.
17	UNDERLOAD	Motor load is lower than expected. Check for disconnected load. Check parameters 3013 UNDERLOAD FUNCTION through 3015 UNDERLOAD CURVE.
18	THERM FAIL	Internal fault. The thermistor measuring the internal temperature of the drive is open or shorted. Contact Carrier.
19	OPEX LINK	Internal fault. A communication-related problem has been detected between the OMIO and OINT boards. Contact Carrier.
20	OPEX PWR	Internal fault. Low voltage condition detected on the OINT board. Contact Carrier.
21	CURR MEAS	Internal fault. Current measurement is out of range. Contact Carrier.
22	SUPPLY PHASE	Ripple voltage in the DC link is too high. Check for missing main phase or blown fuse.
23	RESERVED	Not used.
24	OVERSPEED	Motor speed is greater than 120% of the larger (in magnitude) of 2001 MINIMUM SPEED or 2002 MAXIMUM SPEED parameters. Check parameter settings for 2001 and 2002. Check adequacy of motor braking torque. Check applicability of torque control. Check brake chopper and resistor.
25	RESERVED	Not used.
26	DRIVE ID	Internal fault. Configuration block drive ID is not valid.
27	CONFIG FILE	Internal configuration file has an error. Contact Carrier.

Table 37 — Alarm Codes

ALARM CODE	ALARM NAME IN PANEL	DESCRIPTION AND RECOMMENDED CORRECTIVE ACTION
2001	—	Reserved
2002	—	Reserved
2003	—	Reserved
2004	DIR LOCK	The change in direct being attempted is not allowed. Do not attempt to change the direction of motor rotation, or Change parameter 1003 DIRECTION to allow direction change (if reverse operation is safe).
2005	I/O COMM	Field bus communication has timed out. Check fault setup (3018 COMM FAULT FUNC and 3019 COMM FAULT TIME). Check communication settings (Group 51 or 53 as appropriate). Check for poor connections and/or noise on line.
2006	AI1 LOSS	Analog input 1 is lost, or value is less than the minimum setting. Check input source and connections. Check the parameter that sets the minimum (3021) and the parameter that sets the Alarm/Fault operation (3001).
2007	AI2 LOSS	Analog input 2 is lost, or value is less than the minimum setting. Check input source and connections. Check the parameter that sets the minimum (3022) and the parameter that sets the Alarm/Fault operation (3001).
2008	PANEL LOSS	Panel communication is lost and either the VFD is in local control mode (the control panel displays HAND), or the VFD is in remote control mode (AUTO) and is parametrized to accept start/stop, direction or reference from the control panel. To correct, check the communication lines and connections, Parameter 3002 PANEL LOSS, and parameters in groups 10 COMMAND INPUTS and 11 REFERENCE SELECT (if drive operation is REM).
2009	—	Reserved
2010	MOT OVERTEMP	Motor is hot, based on either the VFD estimate or on temperature feedback. This alarm warns that a Motor Overload fault trip may be near. Check for overloaded motor. Adjust the parameters used for the estimate (3005 through 3009). Check the temperature sensors and Group 35 parameters.
2011	UNDERLOAD	Motor load is lower than expected. This alarm warns that a Motor Underload fault trip may be near. Check that the motor and drive ratings match (motor is NOT undersized for the drive). Check the settings on parameters 3013 to 3015.
2012	MOTOR STALL	Motor is operating in the stall region. This alarm warns that a Motor Stall fault trip may be near.
2013*	AUTORESET	This alarm warns that the drive is about to perform an automatic fault reset, which may start the motor. To control automatic reset, use parameter group 31 (AUTOMATIC RESET).
2014*	AUTOCHANGE	This alarm warns that the PFA autochange function is active. To control PFA, use parameter group 81 (PFA) and the Pump Alternation macro.
2015	PFA INTERLOCK	This alarm warns that the PFA interlocks are active, which means that the drive cannot start any motor (when Autochange is used), or a speed regulated motor (when Autochange is not used).
2016	—	Reserved
2017*	OFF BUTTON	This alarm indicates that the OFF button has been pressed.
2018*	PID SLEEP	This alarm warns that the PID sleep function is active, which means that the motor could accelerate when the PID sleep function ends. To control PID sleep, use parameters 4022 through 4026 or 4122 through 4126.
2019	ID RUN	The VFD is performing an ID run.
2020	OVERRIDE	Override mode is activated.
2021	START ENABLE 1 MISSING	This alarm warns that the Start Enable 1 signal is missing. To control Start Enable 1 function, use parameter 1608. To correct, check the digital input configuration and the communication settings.
2022	START ENABLE 2 MISSING	This alarm warns that the Start Enable 2 signal is missing. To control Start Enable 2 function, use parameter 1609. To correct, check the digital input configuration and the communication settings.
2023	EMERGENCY STOP	Emergency stop is activated.

*This alarm is not indicated by a relay output, even when the relay output is configured to indicate alarm conditions (parameter 1401 RELAY OUTPUT = 5 [ALARM] or 16 [FLT/ALARM]).